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The economics of subjective security and camera surveillance

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The Economics of Subjective Security and Camera Surveillance

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CHAPTER 1

Approaching an Economics of Public Security

1.1 Introduction

1.1.1 The Importance of Public Security

Public security is an essential precondition for personal freedom, civil liberties, and the functioning of political institutions in a market economy. The protection against infringements from third parties against life and limb is an important human need.[1] Whether people feel secure or insecure plays a crucial role for their individual well-being, influences their behavior, and determines the demand for public security. Consequently, the pursuit of public security stands high on the political agenda of many Western nations and is a booming area of public as well as private investment.[2]

Therefore, public security has become a salient policy issue and now features prominently in the news, public discourses as well as in programs of political parties of all shades. With regards to macroeconomic relevance, a huge and steadily increasing amount of public (and private) resources are being invested for public security.[3]

Public security is also often discussed in the context of terrorism nowadays.[4] In the economic analysis of terrorism, different approaches have been developed to estimate its economic costs (for a survey, see Frey et al. 2007). These approaches are helpful in understanding the economic costs of crime and other sources of insecurity. In a specific application to terrorism in the United Kingdom and France, the life satisfaction approach is introduced to value the psychic cost of terrorism or the welfare gains from security in the absence of terrorism (Frey et al. 2009).

In general, 'public security' has a variety of material and symbolic meanings, can be positively or negatively delimited and might relate to a public or private response to a wide range of threats (Zedner 2003a, b). In the present analysis, the focus is on 'public security' conceptually understood as the absence of infringements upon physical health or property, i.e. we do not refer to social security, health, environmental, or 'national security' in a foreign policy sense.

1.1.2 Theoretical Foundation

In this report, the research relies on a behavioral economics perspective rooted in rational choice theory and social psychology. It draws upon existing research in the economic analysis of crime championed by Becker (1968) and Ehrlich (1973) and in rational choice criminology (e.g. the 'Routine

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1 In a broad Lockian sense, security is defined and delimited as the reverse of illegitimate interferences in protected areas of property, i.e. life, freedom, and possession. More narrowly, security is analyzed with regard to criminal as well as (to some extent) to anti-social, deviant behavior. Where necessary, we will differentiate between concepts such as 'objective' vs. 'subjective security', 'safety' vs. 'security', or 'insecurity' vs. 'fear' vs. 'risk expectations.

2 In 2007, e.g., 'personal security' was mentioned by 30% of the respondents as a top-5 worry in Switzerland (Credit Suisse 2007a). At the same time, 'security' is the single most frequent answer – named by 26% of respondents – to the following open question: "Tell us what, for you personally, 'Switzerland' stands for?" (Credit Suisse 2007b).

3 In Germany, e.g., total public expenditures for public security amounted to 32.3 billion euros in 2004 excluding national defense spending (Schulze-Steikow 2007).

4 For an economic approach to analyzing terrorist behavior see, e.g., Frey (2004) and Krueger (2007).

Activity Approach' by Cohen and Felson 1979). Thorough overviews are provided in Freeman (1999), Entorf and Spengler (2003) and Benson and Bowmaker (2005). With regard to empirical research, the project will take up recent insights in dealing with data on crime and security (see, e.g., the contributions by Levitt 1997, Donohue and Wolfers 2005, as well as Di Tella and Schardrodsky 2004).

We will pursue an interdisciplinary approach, incorporating, e.g., considerations from political economics as well as psychology, for instance with regard to the cognitive and emotional processes involved in the perception of security. The transfer of insights from psychology and other behavioral sciences into modern economics has turned out to be prolific in various domains where limitations of rational decision-making are relevant (see, e.g., Camerer et al. 2003; Frey and Stutzer 2007). Moreover, an interdisciplinary approach appears to be promising, considering the prevailing emphasis in economics on deterrence (detection, conviction and punishment of offences; see Freeman 1999).

1.1.3 Research Objectives

This project seeks to contribute to a better understanding of providing public security. To begin with, there is a limited understanding of the relationship between objective risks and subjective security. With regard to new technological possibilities such as camera surveillance, the possible consequences of these innovations in crime prevention require more empirical analysis.

In the current political debate, many relevant issues for public security are brought up: (i) the integration of technological innovations, such as camera surveillance, electro-shocking devices and electronic handcuffs, in fighting crime; (ii) the role of communication in mediating public security (particularly via the media system and political propaganda); (iii) the nature of perception processes responsible for deviations between subjective and objective security.

Many of these issues have barely been covered in socio-economic research. In this report, two interrelated topics are addressed: First, determinants of subjectively perceived security and potential causes for gaps between subjective and objective measures of security will be theoretically analyzed and empirically tested. Second, based on the literature, the impact of camera surveillance is scrutinized (i) on illegitimate or indecent behavior as well as (ii) on individual perceptions of security. In section 1.3, the focal topics of the research project are introduced in more detail.

The results of the project are expected to contribute to scientific research as well as to be useful for political decision-makers and actors concerned with security on semi-private and private ground. Besides, the insights gained might be conducive to a better structuring of social decision processes regarding the design and the intensity of interferences with civil liberties. Finally, the insights shall provide a valuable input into the public discourse about how to produce security in a democracy.

1.1.3 Outline

The remainder of this introductory chapter is structured as follows: In section 1.2, the issue of public security is approached from an economic perspective. It argues why economics as a social science might prove productive when appropriately applied to public security. Previous research on the economics of crime and deterrence as well as the key features of the market for public security is outlined. Section 1.3 introduces the two central topics covered in this study.

Chapter 2 builds the core of the empirical analysis. The relation between subjective perceptions of security, fear of crime, and objective measures of victimization risk is scrutinized with a focus on possible explanations for perception biases regularly observed in reality. Chapter 3 provides theoretical arguments towards an economics of camera surveillance. Possible hypotheses regarding the way camera surveillance may affect human behavior and corresponding evidence from a multitude of evaluation studies will be systematically structured and summarized. Chapter 4 concludes and sketches some relevant open questions for future research.

1.2 The Economics of Public Security

1.2.1 Public Security as an Economic Good

Security or the protection against infringements from third parties against life and limb as well as the guarantee of freedom, honor and property are important human needs. Thus, security is a valuable good and most people have a strict preference for more over less security, ceteris paribus. However, security is also a scarce commodity, as the production of security necessarily uses resources and thus involves opportunity costs.

Accordingly, security can be interpreted as a valuable and scarce economic good.[5] The value of this good and the presence of opportunity costs imply questions of effective and efficient resource allocation with regards to public security policy: Which security policy best serves citizens' preferences?

As an analytical framework, we will look at a market for security, where demand and supply for public security meet and are coordinated. Thus, as is standard in economic theory, the two dimensions 'supply' (reflecting costs and benefits of production) and 'demand' (reflecting costs and utility of consumption or the willingness to tolerate crime) matter when studying the allocation of an economic good[6]. In the context of public security policy, these aspects can be interpreted as input and output dimensions.

1.2.2 Criminals and Victims as Rational Actors

The economics of crime and policing applies a scientific approach based on the concept of rational choice.[7] This string of research was essentially influenced by the works of Becker (1968) and Ehrlich (1973) on the economics of crime and deterrence and forms the basis of modern security policy. Their ideas have been widely reviewed and applied to various fields such as policing and crime, e.g., by Levitt (1997), Di Tella and Schargrodsky (2004), Benson and Bowmaker (2005), and Di Tella and Dubra (2008).

Amongst the main contributions of applying rational choice theory to public security issues were (a) the view of crime as an ordinary social phenomenon – in contrast to an exceptionally or irrationally motivated behavior conducted by 'bad' individuals, (b) the analytical structuring of an issue every society has to deal with, and (c) the identification of testable hypotheses regarding underlying factors and relations. The model, therefore, helps to enhance the efficiency and effectiveness of resource allocation.

Generally speaking, the underlying assumption is that individuals, i.e. potential offenders as well as potential victims, form expectations about the value of legal and illegitimate activities, taking

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5 According to Schmidtchen (2004), personal or public security is a superior good, i.e. demand increases with increasing income.

6 Per definitionem, there is always (at least) one victim involved in a crime under the condition of complete property rights allocation. Although the term is sometimes used in the literature, no crime is truly 'victimless'. E.g., drug dealing and prostitution (if legally forbidden) avoid obligatory taxation and therefore affect property rights of others.

7 Fundamental literature on rational choice theory and the economic analysis of human behavior is from Becker (1978), Arrow (1986), and Sen (1987). Although the approach has long been a dominant paradigm in economics, it has become more extensively used in other disciplines such as sociology, anthropology, and political science in recent decades. In and beyond sociology, Coleman (1990) has been an influential reference illustrating the explanatory power of rational choice theory.

into account the probability and the intensity of punitive sanctions. Illegitimate behavior occurs if the corresponding expected marginal utility outweighs its expected marginal costs. Simultaneously, potential victims chose the forms and intensities of self-protection measures. Thus, potential offender and potential victim *both* affect the conditions conducive to crime.

For crime to be costly to potential offenders, a series of conditions must be met: A criminal act must be somehow observed, reported to the local authorities, there must be a clarification of facts (and, potentially, an arrest), an accusation, and a conviction to be enforced as a fine or custodial sentence. Institutional design, public policy as well as broader social and demographic developments can affect the costs (the 'price') of crime.[8]

1.2.3 Supply of Public Security

The production and provision of public security is of central importance in modern societies. To provide public security primarily means to control crime. The maintenance of public security is often exclusively associated with public engagement in a state police and a judicial system. This perspective ignores that the level of public security is simultaneously determined also by private engagement (Clotfelter 1978; Ben-Shahar and Harel 1995) as well as by the broad institutional context of a community. The extent to which individuals are or feel secure and protected against infringements can be understood as the result of a market for security.

Still, crime control and the maintenance of 'law and order' have long been cited as classical examples of public goods (see, e.g., Schmidtchen 2003), because of its alleged non-excludability and non-rivalness.[9] There is not a lot of dispute as to whether public good features apply to security in the sense of national defense.[10] Nevertheless, looking at public security the way we define it and considering current developments in its production, it can well be argued that security measures also have attributes of club or private goods. Gated communities and private roads have club good character and there are growing numbers of private, i.e. excludable and rivaling, measures for self-protection such as guns, capsicum mace, private electronic surveillance, etc. Consequently, public security might not be interpreted as a purely public good.

Crime control can be accomplished by individual prevention measures or, alternatively, individual citizens can delegate such activities either to private or to state institutions. The latter, in turn, might contract out specific services to non-state institutions. The provision of public security is determined by multiple factors such as state activities (criminal justice system, police and military services), private engagement (individual self-protection efforts and private security services), as well as by the community's broader institutional framework.[11]

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[8] In Germany, e.g., there were 6.28 million offenses registered in 2007, whereof 3.46 million or 55 per cent have been clarified. While no offense category had a clarification rate of 100 per cent, these rates vary strongly between types of crime: While registered white-collar crimes were clarified with a rate of 95.1% and drug offenses with 94.7%, only 29.6% of all registered thefts and 25.6% of registered property damages were clarified (Bundesministerium des Innern 2008). It remains open to which extent these numbers reflect political priorities, preferences, or relative costs of detection.

[9] Samuelson (1954) is one of the most prominent economists credited with developing the theory of public goods, which he called 'collective consumption goods.'

[10] Recently, even this assumption has been challenged more and more strongly, e.g., in Hoppe (2003).

[11] Sherman (1983) differentiates between three ways of crime control: 'Watching' (observation of people and spaces), 'walling' (making access difficult for offenders) and 'wariness' (behavioral adaption).

The delimitation of private and public precautionary measures often cannot be drawn unambiguously. While the locking of residential doors, the installation of alarm systems, fencing, the engagement of private security services or the building of gated communities can be seen as private efforts to increase security, public measures span a wide range of policing and prosecution services such as public lawyers, courts, and prisons.

The supply side of the market for public security is currently undergoing some fundamental developments. Increasing subsidiary security services by the state are paralleled by a steady expansion of private security services. A specific security instrument that is rapidly spreading is publicly and privately operated camera surveillance or 'Closed-Circuit Television' (abbreviated: CCTV).[12] Whether and to which extent these measures act as substitutes or complements to each other remains to be determined by future research.[13]

Broad questions of privatization of public security underlie these considerations as well as the public good discussion. They are beyond the focus of this analysis.[14] Privatization includes several categories of developments such as (a) the sale of public enterprises or agencies potentially followed by market regulation, (b) 'outsourcing' of specific security services via contracts with private partners ('contracting-out' and 'public-private partnerships')[15], and (c) spontaneous private provision of security without any preceding state delegation ('passive privatization') (see, e.g., de Waard 1999). Public good characteristics do not necessarily imply the requirement of state-run security production. Rather, they imply some coordinative function of governmental authorities (see, e.g., Jung 1998, Schmidtchen 2003).

In general, private provision potentially differs from public provision with regard to the extent of competition, the involved freedom of choice, information, and incentives for innovation, cost reduction, and quality improvement. Topics such as market and state failure, externalities, and redistribution in the context of public security are further investigated, e.g., in Garland (1996), Benson (1998), Gamma (2000), Schmidtchen (2003), Glaessner (2003), or Avant (2005).

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[12] See section 1.3 below and chapter 3 for a more profound discussion of CCTV.

[13] Structuring the process of crime control and prosecution into different steps – such as observation, reporting, clarification of facts, arrest, accusation, conviction, and sentence – might be helpful in analyzing this question (Schmidtchen 2004). One possible hypothesis is that measures focusing on different steps in the process of crime control are complementary, while measures aimed at the same process level are substitutes.

[14] While some decades ago, the state was seen as the sole responsible provider of public security, more and more non-state actors are entering this market nowadays. Thereby, in the Anglo-Saxon tradition, the privatization of public security is interpreted as restoration of competences (once delegated to the state) to the original holders of those rights. The European concept of the state seems to differ. In 1990, the European Council organized a conference on the 'Privatisation of Crime Control.' Jung (1990, p. 117) summarized the discussion as follows: "At any rate, it was emphasized that the public authorities cannot be discharged from their final and inalienable responsibility for the maintenance of public peace and the administration of justice." A comprehensive economic analysis of the privatization of the criminal justice system is offered in Benson (1998). Various interesting issues – e.g., questions of competition and efficient production, legal and regulatory aspects – arise when studying privatization of security services. Zedner (2003a, b) maps out some variants on the public-private divide in the practice of public security informing comparative analysis in the field.

[15] An example for broad 'contracting-out' in the institutional context of Switzerland is the enterprise 'Securitas' which is responsible for specific policing services (area patrols, directing traffic, parking control, law enforcement, object protection, theft prevention, body guarding, providing event security and prisoner transports) in more than 30 cities.

1.2.4 Demand for Public Security

For citizens' demand, public security matters with regards to the 'objective' risk of victimization as well as the subjectively perceived level of security. There are various ways of looking at public security in an 'objective' sense: Either one focuses on the amount of criminal acts (in a certain area and time period) or on the probability of being victimized (as a member of specific socio-demographic groups).

Assuming a positive relationship between input and output measures in the production of public security, measuring input (financial, human or physical) resources is sometimes also used to quantify objective security. Additionally, the market potentially internalizes security risks to some extent, so that they are reflected in property values, insurance rates, economic prosperity, or in a region's appeal mirrored by local public and private investments.

In contrast to 'objective security', 'subjective' measures of public security include fear of crime as well as individually perceived level of public security or of the risk of being victimized. Increasing feelings of security in the population has become a primary objective of public policy, e.g. in the German criminal justice policy (Bundesministerium des Innern and Bundesministerium der Justiz, 2001).

Data on subjective security mostly come from survey items eliciting self-reported fear of crime, feelings of insecurity, anxiety, individual well-being, etc. Thus, while subjective security is reflected most concretely in the fear of being a victim of specific crimes (crime types), there are also measures for more general feelings of insecurity at home, in the neighborhood, and in town at day or nighttime.

Subjective valuations of miscellaneous aspects of one's life and environmental context also have consequences and are reflected in broader psychological constructs such as subjective well-being (life satisfaction or happiness). Measures of subjective well-being could in addition be considered when evaluating public security on the basis of subjectively indicated information.

In sum, whether people feel secure or insecure plays a crucial role for their individual well-being. Furthermore, perceptions of security are pivotal determinants of security demand in democratic political systems and they can induce significant social costs (e.g. Sunstein 2005, Karsted and Lafree 2006, Dolan and Peasgood 2007).

In order to pursue an effective security policy and to understand developments in both security policy and the corresponding industry, it is important to understand how perceptions of security are formed and how they might systematically differ from objective risk exposure (see, e.g., Boers 2003, Ferraro 1995, Garofalo 1979, Jackson 2006). Subjective security and fear of crime are also relevant when analyzing novel public security measures such as camera surveillance. Individual perceptions are often reflected in acceptance of or opposition to such measures.

1.3 Two Topics for Empirical Analysis

1.3.1 Fear of Crime, Victimization Risks and Signals of Public Disorder

In the production and provision of public security, affective and cognitive perception processes play a crucial role. There is a widespread understanding that subjective security and objective risks do not overlap perfectly (e.g. Michalos 1980). Perception processes might be important in explaining those potential biases in subjectively perceived versus statistically quantified security levels. Subjective perceptions and valuations of security and fear have been progressively studied for years in legal, criminological and sociological research (e.g. Box et al. 1988, Borooah and Carchach 1997, Eisner et al. 2000, Gabriel and Greve 2003, Hale 1996, Killias 1990, Schwarzenegger 1992).

This research has contributed significantly to the understanding of the determinants of fear of crime, mainly using sociological, psychological and socio-demographic variables (Farrall et al. 2000). Subjective security is also increasingly relevant as a public policy issue: Raising subjective security in the population has become a primary objective of criminal policy.[16]

Consequently, in order to pursue an effective security policy, it is important to understand how perceptions of security are formed and how they might systematically differ from 'objective' exposure to risk. As a starting point, a concept of subjective security is explored that distinguishes between aspects of cognitive risk perceptions and a comprehensive range of other factors that form individuals' security preferences.

One central objective of this analysis is to explore the role of public disorder in subjective public security, as it lies at the core of prominent theories on crime prevention. In particular, we want to test the hypothesis that petty crimes (like theft, graffiti or scratching windows, cars etc.) and uncivil behavior (such as littering or rude behavior) create an atmosphere of insecurity.

This claim underlies the notion of 'zero tolerance' and 'broken windows'. It is argued that an atmosphere of insecurity might facilitate more and possibly worse criminal behavior (e.g., Dennis 1997). However, it has proven hard to provide empirical evidence for a causal effect of zero tolerance measures on crime rates, although a positive correlation is often observed (see Levitt and Dubner 2005).

But even if public disorder were a poor signal for risk, it might be an important factor causing people to experience a feeling of fear and insecurity. In the empirical research (chapter 2), a two-step analysis is applied. First, the correlates of subjective security are identified. Second, mediating factors driving possible deviations of subjective and objective security measures are introduced.

Possible implications for public policy and private decision-making processes will also be alluded to. In this context, the focus is on the role of public disorder. Data from three surveys conducted by the City Police of Zurich covering a large sample of the urban population in the Swiss city of Zurich in 2004, 2006, and 2008 is evaluated.

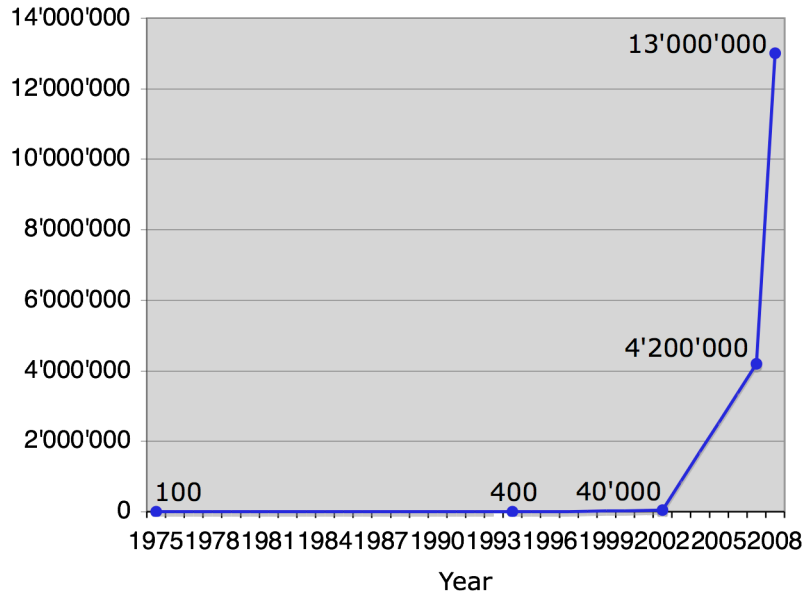
[16] For example, this is the case in Germany (Bundesministerium des Innern and Bundesministerium der Justiz 2001, 2006).

1.3.2 Towards an Economics of Camera Surveillance

Technological innovations are continuously opening up new opportunities in the provision of public security. Camera surveillance[17] of public and private spaces is probably the most rapidly spreading and, at the same time, one of the most controversial instruments in security policy today. Camera surveillance signifies (a) a general extension of public surveillance systems and (b) a shift from direct, personal or print surveillance to remote, electronically transmitted and even computer enhanced self-monitoring, visual surveillance (Surette 2005).

In recent years, a seemingly limitless expansion of electronic surveillance of public and private spaces can be observed in Western countries (Norris and Armstrong 1999). In Britain, camera surveillance is the single most heavily funded non-criminal justice crime prevention measure and has accounted for more than three-quarters of total spending on crime prevention by the British Home Office at the turn of the century (Welsh and Farrington 2003). Figure 1 illustrates the rapid deployment of CCTV in the United Kingdom.

Figure 1: Number of CCTV-Cameras in the U.K.



Sources: Associated Press (2007), Chivers (2008).

Although the United Kingdom may look like an extreme example for CCTV deployment, current global CCTV market analyses indicate a steep increase in future CCTV coverage (RNCOS 2008). This fast-developing technology has the potential to enhance capabilities of detecting or retracing criminal activities. It may be an effective support in deterring crime, because empirical research has shown that the probability of punishment (which directly relates to the detection probability) seems to be relatively more important from an offender's point of view than a punishment's severity (Benson 1998).

Moreover, camera surveillance can be interpreted as a reflection of the underlying trend towards 'decentralizing' and 'privatizing' the production of public security. While CCTV may serve a

[17] In the Anglo-Saxon literature, the technology is often headed under the name 'closed-circuit television' (CCTV).

number of functions, crime prevention definitely remains one of its primary objectives (Kinzer 2004). Accordingly, CCTV is categorized as a situational crime prevention measure (Clarke 1995), more specifically a technique of 'formal surveillance' (Clarke and Homel 1997).

While technological developments in camera surveillance systems are proceeding at a rapid pace, not even the effects and implications of first generation applications have been sufficiently assessed or comprehended (Nunn 2003). This development has so far attracted attention mainly in criminological, sociological, technology- oriented and urban planning research (e.g. Norris et al. 1998, Painter and Tilley 1999, Surette 2005).

Meta-analyses of initial evaluations of camera surveillance systems indicate, although not without exceptions, that their installation has resulted in (small) reductions in crime. A systematic overview and summary of previous evidence is reported in chapter 3. Interestingly, virtually every systematic study showing a desirable effect on criminal activity (a) was carried out in the United Kingdom and (b) concentrated on camera surveillance schemes implemented in car parks.

More recently, evaluations of new camera surveillance schemes have also been published in Australia, Germany[18], Japan, Norway, Sweden, and the United States.[19] These studies show mixed results (Welsh and Farrington 2007). This holds in particular for an area with extensive application of CCTV, public or mass transportation, where there is only scarce and inconclusive evidence on CCTV effectiveness.

Pioneering work covering specific aspects of camera surveillance in the institutional context of Switzerland is by Ruegg et al. (2006). Their study has benefited from a broad research team including people with a legal, geographical and sociological academic background. Our analysis differs in several respects from Ruegg et al. (2006). The conceptual work focuses on behavioral consequences of camera surveillance from a cross-disciplinary economic and psychological perspective and presents corresponding available evidence.[20]

In spite of the growing literature on CCTV, the specific cognitive and emotional mechanisms influencing subjective perceptions of security and inducing behavioral reactions in the presence of cameras are yet to be scientifically examined. Previous scientific coverage of the topic mostly lacks a comprehensive analysis of the behavioral reactions of the involved actors from a rational choice perspective that takes up insights from economics and psychology.

In this study, the specific research questions with regard to the economics of camera surveillance are conceptually outlined and discussed. The objective is to provide an analytical foundation for an economic analysis of CCTV effectiveness with regard to illegitimate or indecent behavior as well as to subjective feelings of security. This involves issues such as whether undesired substitution effects, adverse behavioral responses, or motivational spillovers to other spheres of life accompany this form of institutionalized control.

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[18] See, e.g., Brandt (2004), Buecking (2007), Buecking und Kubera (2004), and Zurawski (2007).

[19] The latest study from the U.S. analyzing camera effectiveness in two Los Angeles areas again found no statistically significant crime reduction effects and only unclear evidence on crime displacement (Cameron et al. 2008).

[20] Ruegg et al. (2006) primarily pursued a jurisprudential (analyzing the legal corpus applicable on camera surveillance), sociological (deliberation and interactions between actors in the security sector) and technological (configurations of camera surveillance and their technological evolution) perspective.

Current empirical research is discussed in a systematic literature review structured by the context in which cameras are applied. In this manner, this study should add to a better understanding of the contribution of CCTV in providing public security, create the basis for the identification of conditions influencing CCTV effectiveness and contribute to current policy discussions.

CHAPTER 2

Challenges to an Economics of Security: Signs of Public Disorder, Victimization Risk, and Fear of Crime

2.1 Introduction

> "The fear of crime is a great example to use when teaching social research methodology. This is not just because the words 'fear' and 'crime' are sexy enough to wake up those in the back row. This is an illustrative topic because it displays a number of cautionary tales relevant to the use of the survey in the social sciences" (Jackson 2005, p. 297).

2.1.1 The Importance of the Fear of Crime

Human beings commonly would like to feel secure and avoid fear of crime. These preferences for public security are expressed by private demand for prevention and security measures as well as through the political process influencing the public provision of security. Thus, whether people feel secure or insecure plays a crucial role for individual well-being as well as for public policy (e.g. Dolan and Peasgood 2007, Frey et al. 2009).

Insecurity and fear might further affect individual attitudes, e.g. attitudes towards punitivity, satisfaction with the justice system, xenophobia, etc. as well as behavior. The latter might be affected in potentially multiple ways, e.g. with regards to self-protection or avoidance, i.e. choice of transportation mode or leisure activities.[21]

As perceptions of security and insecurity are pivotal determinants of security demand in democratic political systems, they can induce significant expenditure for security and insurance (e.g. Sunstein 2005, Karsted and Lafree 2006). Adding to the debate about social costs of security preferences, some researchers suggest that fear of crime has become a larger problem than actual crime itself (e.g. Warr 1984, Bennett 1990, Hale 1992). There is a widespread understanding that subjective security and objective risks (measured by official crime statistics) do not overlap perfectly and are often very weakly related (e.g. Michalos 1980, Cook and Skogan 1984, Skogan 1986).

The goal of this analysis is to identify mediating factors leading to deviations between objective and subjective measures of security. Subjective perceptions of the crime problem might be a result of how people make sense of their environment and community in a broader sense.[22] The main objective will be to explore the role of public disorder in subjective public security as it lies at the core of prominent theories on crime prevention (Skogan 1999). In particular, we want to test the hypothesis

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[21] Trends in fear of crime are captured based on reported surveys. For example, the Eurobarometer surveys covering, inter alia, subjective security questions and with at least 1000 respondents per survey wave and each of the 15 'old' European Union member states (Hartung 2001, Christensen 2002, Reif and Marlier 2002). The Eurobarometer surveys generally indicate a slow but steady increase in the fear of crime across the European Union – except for Germany – around the turn of the century between 1996 and 2002 (id.). Also in the United States, national public opinion surveys regularly indicate that crime is amongst the highest priority concerns (Stephens 1999).

[22] See. e.g., Jackson (2005, p. 309) arguing that "risk perception and vulnerability are inherently subjective; they are embedded in the context of the social and physical environment, where crime gathers its meaning."

that petty crimes (like theft, graffiti or scratching windows, cars etc.) and uncivil behavior (such as littering or rude behavior) create an atmosphere of insecurity.

This latter claim underlies the notion of 'zero tolerance' and 'broken windows' introduced by Wilson and Kelling (1982). It is argued that an atmosphere of fear might facilitate more and possibly worse criminal behavior (e.g., Dennis 1997). However, it has proven hard to provide empirical evidence for a causal effect of zero tolerance measures on crime rates, although a positive correlation is often observed (see Levitt and Dubner 2005). Thus, disorder might be a poor signal for risk but an important factor for people to experience a feeling of fear and insecurity.

Public security is a scarce good, and there are substantial costs involved in its provision. In order to pursue an effective security policy, it is important to understand how perceptions of security are formed and how they might systematically differ from objective exposure to risk.[23] There is a possibility of either (a) 'false security' (a false sense of security) or (b) 'false insecurity'. However, in both states, there are 'true feelings' involved. The first two types of (perception) errors might induce relevant behavioral consequences: Either an under-investment or an over-investment (overshooting reaction) in private precautions could result. We investigate the determinants and discuss some consequences of fear of crime in the context of demand for higher security as well as for an elevated feeling of being secure.

Approaching the issue from an institutional (or constitutional) perspective (Buchanan 1991) implies some fundamental research questions: What institutional conditions and policies (a) affect anticipatory feelings like fear of crime in a way that they are most productive (functional), and (b) reduce the costs in individual welfare due to fear and insecurity? Institutions should enhance individuals' capabilities to deal with fear and behaviorally react to it in an appropriate way and, lastly, increase their options to maximize well-being. This can happen by informing – not by giving definite and binding advice to – people about biased security perceptions, systematic misprediction errors, and resulting over- or understatements in fear levels.

2.1.2 Previous Research

Subjective perceptions of security and fear have been studied for years in legal, criminological and sociological research.[24] Fear of crime was first discerned as an innate social problem by national crime surveys in the United States in the late 1960s (Biderman et al. 1967, Biderman 1967, Ennis 1967, Reiss 1967).

While the fear of crime received only scant scientific attention until the 1980s (Bannister and Fyfe 2001), it has since then been attracting a rapidly growing policy and academic interest and is now one of the most intensively researched topics in criminology (e.g. Hale 1996, Farrall et al. 2000, Gray et al. 2008). Often, fear of crime is considered as a more important and widespread problem than crime itself (Hale 1996).

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[23] It is important to note that a unidirectional policy of reducing fear might not be an optimal solution because 'fear' also acts as a primary, evolutionary indispensable motivator. E.g., fear stimulates individual precaution and wariness. For a discussion of emotional phenomena and especially fear in urban contexts, see Robins (1995).

[24] See, e.g., Borooah and Carchach (1997), Box et al. (1988), Ditton et al. (2000), Eisner et al. (2000), Farrall et al. (2000), Farrall et al. (2009), Gabriel and Greve (2003), Gilchrist et al. (1998), Hale (1996), Killias (1990), and Schwarzenegger (1992).

This research has contributed significantly to the understanding of the determinants of fear of crime, mainly using sociological, psychological and socio-demographic variables (Farrall et al. 2000). Some studies have focused on socio-demographic variables such as age and other measures of physical vulnerability (for references, see Clerici and Killias 1999). The literature has led to the conclusion that fear of crime is a multidimensional concept that also involves cognitive and emotional aspects (Wilcox Routree 1998).

With regard to differences between subjective security and objective risks, several possible reasons are alluded to in the literature: (i) People's experiences with violence in the past that form their individually perceived set of risk outcomes, (ii) exposure to violence in the media, (iii) the criminalization of behavior (e.g. drug consumption), (iv) subsequent behavior after violent acts, (v) adaptation, (vi) visual presence of police forces in the public space, and (vii) public disorder.

Conceptually, the work outlined here relates and adds to recent literature on fear in economics and offers a link to the rapidly expanding corresponding literature in criminology. Subjective feelings of insecurity, produced by more or less vaguely perceived threats, are viewed as 'anticipatory' (Caplin and Leahy 2001). These more affective psychological states are paralleled by cognitive information processing and 'anticipated' risk perception – in the more conventional sense of expected utility concepts.[25] As individuals suffer economic and psychic costs due to the possibility of becoming a victim of crime (Dolan et al. 2005, Dolan and Peasgood 2007, Frey et al. 2009), they may react to these feelings by either changing behavior or by investing in physical capital (preventative measures) and mental capital (Becker and Rubinstein 2004).

Notwithstanding the growing interest in these topics observed in social sciences, the traditional economic approach to public security and crime has been limited insofar, as it has not been capable to adequately explain security-relevant behavior and individual utility by mostly restraining itself to expected utility, where risk perceptions are cognitively anticipated. The traditional expected utility approach does not refer to emotions and affective utility components.

2.1.3 New Evidence for Switzerland

Novel empirical evidence presented in this study challenges and enriches the framework of public security policy in two dimensions. First, it suggests that there might be only a weak (if any) link between the victimization risk and subjective feelings of insecurity and fear. Second, visible cues for the capability of a community to control crime, i.e. signs of public disorder as well as police presence, matter in a crucial way for individual judgments about public security.

This analysis is based on data from the City of Zurich Police Department.[26] It has conducted three large, representative telephone-based surveys covering the urban population in Zurich (about 2'400 observations each) in 2004, 2006, and 2008 on the issues of perceived subjective security, actual endangerment and victimization. The data also includes information on self-protection behavior and individually observed signals of insecurity or incivility.

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[25] On expected utility theory and its limitations, see the seminal works by Bernoulli (1738/1954), Von Neumann and Morgenstern (1944), Ellsberg (1961), Kahnemann and Tversky (1979), Schoemaker (1882), or Anand (1993).

[26] The data has gratefully been made available by the head of the division of the City of Zurich Police Department responsible for prevention, Jürg Müller.

2.1.4 Outline

The rest of chapter 2 is organized as follows: The conceptual differences between measures for 'objective' and 'subjective' security and related costs will be further explored in section 2.2. Specifically, a concept of subjective security is analyzed that distinguishes between aspects of risk perceptions and a comprehensive range of factors that form individuals' security preferences.

The former aspect is studied in research in economics and psychology dealing with the formation of beliefs about risks and a substantial range of cognitive biases involved in these processes (e.g. Sunstein 2003). Thus, risks can be personal or impersonal (e.g. Kahlor et al. 2006). The latter factors that form individuals' security preferences include various risk outcomes but also procedural aspects when dealing with risks (see, e.g., Frey et al. 2004).

In section 2.3, a theoretical framework for studying subjective security is presented, which differentiates between cognitive and affective components of security perception. The central hypotheses for empirical analysis are outlined in 2.4. In section 2.5, new survey data for the Swiss city of Zurich and the empirical methods employed in this study are described. Section 2.6 contains the empirical findings relating to the various hypotheses tested. The following section 2.7 sketched some relevant open questions for a future research agenda. Section 4.1 (chapter 4) contains concluding remarks.

2.2 'Objective' Versus 'Subjective Security'

When studying different measures for public security, the analytical framework focuses on the demand- or output-side of public security production. The concepts and measures discussed hereafter reflect various facets of outcomes generated by public security authorities and can, thereby, help evaluating security policy effectiveness.[27] In general, we differentiate between two aspects of public security that both matter to individuals. These two concepts are termed 'objective' and 'subjective security', respectively.

2.2.1 Objective Security and Victimization Risk

Concepts and Measurement: Traditionally, empirical economics has been relying upon official, 'objectively measured' statistics as primary data sources. Such statistics also exist within the sphere of public security and crime prevention.[28] However, in contrast to other official statistics – e.g., relating to aggregated domestic production, labor or capital markets – relatively severe methodological flaws and practical difficulties render (officially published) crime statistics (a) hardly comparable and (b) systematically biased.

They are hardly comparable because of stark regional differences and inconsistencies in definition, aggregation, and collection of the relevant data.[29] They are systematically biased as under-reporting by victims and witnesses results in a downward bias inherent to official crime statistics. Relative costs of reporting, police presence and effectiveness, data manipulation in recording and classifying incidents may also be crucial issues.[30]

In spite of the various ongoing efforts observable in order to methodologically enhance and harmonize these records[31], crime statistics' value in terms of empirically analyzing individual security-related considerations, affective reactions, and behavior is questionable. Another critical aspect is "the threat of doing worse as a result of doing better" (Skogan 1999, p. 38), i.e. the possibility of political data manipulation in the context of official crime statistics, which might also be interpreted as police effectiveness indicators by the public.[32]

Instead, criminologists and sociologists increasingly rely on *victimizations surveys*. These studies survey household members about crimes committed to them and the respective reporting to

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27 A general overview on how to measure crime and delinquency is provided, e.g., in Aebi (2006).

28 In the United States, e.g., the level of crime and corresponding changes are measured by the Federal Bureau of Investigation's Uniform Crime Reports (UCR). "These often serve as a first grist for the political mill – local elections have been greatly influenced by crime reports" (Stephens 1999, p. 56).

29 In spite of this well-known difficulty, inter-city comparisons are regularly done on the basis of crime statistics (Stephens 1999).

30 On police-based versus survey-based measures of crime, see, e.g., Silberman (1978), Kelling (1996), Skogan (1999), Stephens (1999), Mosher et al. (2002), Rand and Rennison (2002), Aebi (2006), Lynch and Addington (2006), Land (2007), and Haymoz et al. (2008). Reporting behavior differs by population group insofar as younger, low-income, male individuals report at a relatively low rate (Skogan 1999). With regards to police and political data interpretation (and manipulation), it is essential "who gets the credit – or the blame – for fluctuations in reported crime" (Stephens 1999, p. 57).

31 On the intended harmonization of decentrally (on a 'cantonal' level, due to Swiss federalism) collected police statistics in Switzerland, see Bundesamt fuer Statistik (2009).

32 See, e.g., Skogan (1999) or British Broadcasting Cooperation (2008). Mosher et al. (2002, p. 93) conclude: "The particular reasons or motives for the police manipulation of crime statistics are wide and varied. Economic interests and political posturing are sometimes the underlying cause of the artificial inflation of crime statistics by law enforcement agencies, whereas these and other reasons may be the basis for the undercounting of crime."

the police and, thus, entail fundamental advantages compared to official crime statistics: Most importantly, they provide a broader view of crime and result in more accurate cross-sectional measures of criminal victimization by including (minor and major) offences not reported to the police (Rand and Rennison 2002). In the United States, it has being observed that survey measures of crime do not correlate very strongly with changes in official crime statistics (Stephens 1999).

However, the survey approach to crime measurement also has its limitations. Refusal rates in victimization surveys are relatively high and growing, rendering coverage a serious problem (Skogan 1999). Some crimes that are only reported by (commercial or non-commercial) organizations are not covered at all in household surveys (Shapland 1995) and accessibility of people for telephone surveys strongly correlates with income, race, and local crime rates (Skogan 1995).

Furthermore, in order to be representative, surveys have to cover large numbers of respondents (Kraemer and Thiemann 1987) and, thus, involve substantial costs. Finally, repeated victimization, a crucial element characterizing high-crime environments, is not very reliably measurable with surveys.[33] Due to the mentioned problems with officially published crime statistics (citizen reporting and police recording behavior), in this study, information gained from victimization surveys is analyzed.

Related Costs: Another methodological issue surrounding 'objective security' is determining the generally significant tangible and intangible costs involved with criminal victimization.[34] Trying to estimate the burden of crime and using this information in political decision-making is useful in several respects (Dolan et al. 2005): Only by calculating the full impact of different crimes, (a) the respective social costs can be compared relative to other crimes as well as relative to other measures of criminal and social policy and (b) this can also deliver useful information about intertemporal trends in the social burden of crime and, therefore, inform resource allocation decisions with regard to public security.[35]

Costs associated with crime take various forms, and these different cost types vary in their amenability to empirical measurement in money terms. On the one hand, crime causes *tangible* costs, which are relatively easy to quantify (Dolan et al. 2005). These tangible costs can either be *anticipatory*, i.e. resulting from resources spent in attempts to reduce the probability of victimization (precautionary measures), or they can be *realized* costs of crimes that have already occurred. Realized costs can be broken down into direct costs (financial resources devoted to mitigate the consequences of a criminal victimization, e.g. injury treatment, and criminal justice costs) and indirect costs (opportunity costs and a reduction of social welfare due to productivity losses).[36]

Intangible costs of crime, on the other hand, are more difficult to capture and quantify in money terms (id.). *Realized* intangible costs relate to the physical pain and psychological suffering inflicted upon victims, their friends and family members. *Anticipated* intangible costs are associated

[33] Skogan (1981) already pointed to various reasons complicating the measurement of repeated victimization: Telescoping, forgetting, temporal ordering, differential recall, framing effects, etc.

[34] For an international comparison of the burden of crime in E.U.-countries, see Van Dijk et al. (2005).

[35] Nevertheless, the costs associated with crime (and the fear of crime) are unlikely to be stable over time: They might change with factors unrelated to victimization risks and health system costs, e.g., they can fluctuate with political strategies of governments, media coverage of crime, and actions by the police and neighbors (Dolan and Peasgood 2007).

[36] On realized costs of crime to the victim, see Brand and Price (2000).

with feelings of insecurity and fear of crime. These costs will be discussed in more detail in the following section 2.2.2.

2.2.2 Subjective Security and Fear of Crime

> "Many would argue that the local government is as obligated to deal with the fear of crime as it is to deal with the actual incidence; that it is important, whatever the basis for existing fears, that citizens feel secure in their home and on their streets" (Goldstein 1977, as cited by Stephens 1999, p. 59).

Concepts and Measurement: Besides statistical victimization risks, the mere fear of crime and a broad range of subjective perceptions of public security have potentially important impacts upon individual utility and behavior. 'Fear of crime' has become a central concept in recent criminological and social psychological research – and it can also be productively analyzed with the behaviorally oriented approach inherent in modern economic science.[37]

In order to understand public security and individual behavior more profoundly, the underlying processes forming subjective security must be taken into account. This is important for informing public security policy, e.g., if subjective security and decision-making processes are based on misguided beliefs about risks.[38] In that latter case, policy could aim at changing or de-biasing information and signals extracted by the individual citizens.

The most frequently used instruments to elicit fear of crime are subjective measures, e.g. implemented in surveys. There are several caveats regarding survey measurement of attitudes such as feelings of insecurity and fear of crime. In particular, the attitude measures seem to be highly affected by the time of day, the local geographical context and the people passing by when subjects are interviewed directly on the street (Miller 2008). Skogan (1999) and Stephens (1999) stress practical and methodological problems such as coverage, repeated victimization, rising refusal rates, and financial expenses (a serious problem especially for local police departments) in the context of survey figures.

Corresponding questionnaire items with a focus on security-related attitudes are commonly formulated in one of two ways (e.g. Ditton and Farall 2000, Lee 2001, Gabriel and Greve 2003, Vanderveen 2006, Gray et al. 2008):

a) *'Subjective insecurity'* is surveyed by very vaguely framed questions focusing one how secure one feels when, e.g., being at home, walking around in the neighborhood or in the city, at day- or at nighttime. Such items might evoke a broad range of general and deeply rooted feelings of well-being, and do not necessarily reflect directly crime-relevant attitudes. Vaguely formulated crime surveys might pick up emotions and attitudes quite distinct from actual fear of crime such as anger (Ditton et al. 1999b,c) or anxieties caused by non-security-related factors that individuals are unhappy with in their environment (Bannister and Fyfe 2001).

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[37] Until recently, 'fear of crime' had often been described as a vaguely defined concept, about which there is considerable theoretical and empirical confusion (Hale 1996, Gabriel and Greve 2003). Fear of crime incorporates expressive aspects (attitudes towards crime and society in a broader sense) as well as experiences (situations of victimization or fear).

[38] This would be the case, e.g. if environmental cues are not informative about 'true' victimization risks and nevertheless influence behavior.

b) *'Fear of crime'* relates more directly and explicitly to the fear or worry about specific crimes (such as theft, burglary, and rape) or types of crime – the most relevant difference being between violent and property crimes.[39] The fear of crime concept appears to be more relevant for evaluating public security policy than the broader 'subjective security' measures and is therefore preferred for our analytical purposes. For instance, already Warr (1984) has found that crime- or offense-specific measures of fear are more strongly linked to one another than are broader measures such as those eliciting subjective feelings of insecurity and anxiety.

Skogan (1993, 1999) distinguishes between four ways of conceptualizing crime: Three cognitive facets – concern about crime, subjectively assessed risk of victimization, and the perceived threat of crime – and the behavioral component of individual responses to crime. The concern about crime reflects a judgment about the seriousness of crime and other contextual conditions. Perceptions of threat rather reflect vulnerability.

Empirical research has shown that the latter two measures do not correlate strongly with perceived victimization likelihood, e.g. for elderly people (id.). Behavioral reactions to fear of crime can be classified as (passive) 'avoidance' of potentially threatening situations or (active) 'mobilization' of defensive tactics (Furstenberg 1971).

Related Costs: As is the case with actual crime and victimization, tangible as well as intangible costs also accrue from pure fear of crime and feelings of insecurity. Fear of crime can have seriously detrimental physiological, material and psychological effects on people, and these costs need to be included to give a more accurate picture of the total costs of crime (Dolan and Peasgood 2007).

First, fear of crime has impacts upon individual well-being[40], which, in turn, influences physical functioning and health.[41] These *intangible* (in the sense of difficult to quantify in absolute money terms) physical and psychological health-related losses are discussed in-depth and estimated in Dolan and Peasgood (2007). Such intangible costs might also be elicited by stated preference or willingness-to-pay (WTP) approaches.[42] However, suitable data to estimate intangible costs are hard to find: If someone experiences a loss of personal freedom, she or he might not be able to place a value on that loss, although it reduces his or her well-being (Sen 1987).

Furthermore, fear of crime alters behavioral patterns and so-called 'routine activities'. Thereby, it might contribute to an eroding (i.e. a reduction of pedestrianization) of specific places turning into 'no-go' areas via withdrawal from the community. Therefore, fear of crime finally also changes

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[39] On the development of the concept of 'fear of crime', see Garofalo (1981), Maxfield (1984), Ferraro and LaGrange (1987), Ferraro (1995), Farrall et al. (1997), or Skogan (1993, 1999).

[40] In a 2001 survey covering public attitudes in the United Kingdom, crime was mentioned by 24 per cent of respondents as an important factor affecting quality of life (DEFRA 2001).

[41] See, e.g., Stafford et. al. (2007). There are many pathways by which fear of crime might negatively influence health: It can increase health-reducing behavior (McCabe and Raine 1997, Dowdell and Santucci 2003), lead to exposure to (allegedly) threatening conditions (Elstad 1998, Ross and Mirowsky 2001), to reductions in physical activity (Seefeldt et al. 2002, Ravenscroft et al. 2003), and to reduced social activity and less social capital, again, leading to health losses (McCabe and Raine 1997, Lindstroem 2004, Patsois 2005).

[42] Cohen et al. (2004) find that the WTP per avoided crime substantially exceeds previous estimates based on tangible victim costs and justice-related costs. Furthermore, they find that the WTP were insensitive to the absolute risk of victimization of specific crimes, possibly because people are responding to their very individual understanding of the respective crimes and this understanding influences well-being (id., Dolan and Peasgood 2007).

perceptions and reality of social or community life: It might drain social cohesion or undermine trust and neighborhood stability (e.g. Hale 1996).

For England and Wales, Dolan and Peasgood (2007) estimate the annual health loss caused by the fear of crime at around one fifth (2.1 billion British Pounds or 52.65 Pounds per capita per year) of the total costs of crime, which, according to them, has "some face validity" (p. 129). This might be an underestimation of the actual burden of fear of crime because the estimates neither include non-health losses of changes in behavior or attitudes towards society nor health costs from health-reducing behavior or long-term psychosomatic reactions.[43]

In the United Kingdom, the consequences of crimes against individuals and households account for around 25 of the 60 billion British Pounds total costs of crime in society according to the British Home Office (Brand and Price 2000). This study suggests that 17 of those 25 billion Pounds are attributable to realized intangible costs, i.e. the emotional and physical impact on crime victims. In her study on domestic violence, Walby (2004) emphasizes intangible costs of crime, and estimated them to account for around three fourths of total costs of crime.

Dolan et al. (2005) criticize previously calculated values for the intangible costs of crime in several respects: First, direct values for these costs from revealed and explicitly stated preference studies seem limited in terms of scope and robustness (see also Cohen 1990, Atkinson et al. 2005). Second, research using willingness-to-pay (for avoiding injuries or statistical death) approaches, though already widely applied[44] in social science, mostly focus on non-criminal injuries, and it remains open, in how far these can be translated into the context of crime. A promising way for future cost modeling might estimate the losses in terms of quality-adjusted life years (QALYs), a composite of different stated preference components that overcomes some of the limitations of other approaches (Dolan 2000).[45] In any case, we are still in need of more profound information about the short- and long-term burden (psychological and physical) of crime – with regards to being a victim or an offender.

In addition, previous research has so far not included external financial effects on people close to the victims of crime (as well as on the offenders), such as friends, family, witnesses, etc. (Dolan et al. 2005). Besides these impacts on the social context of victims and offenders, more indirect effects on fear of crime of a broader part of the population and, at last, on their general well-being might further increase the social burden of crime and, at the same time, make it even more difficult to measure.

A variety of *tangible* costs directly or indirectly accrues due to fear of crime. First, fear of crime might induce people to take (an excessive amount of) preventative security measures (Brand and Price 2000). For example, insurance costs and corresponding administration expenditures are at least partly attributable to fear of crime and reveal people's preference to reduce either the risks or the mere

[43] On the other hand, they argue (Dolan and Peasgood 2007, p.129): "Valuing the health loss from fear of crime may risk being an overestimate if fear of crime is interpreted as a displacement of other fears."

[44] An example of such a willingness-to-pay approach is Atkinson et al. (2005).

[45] The analysis by Dolan et al. (2005), using QALYs to estimate the burden of crime, estimated total intangible victim costs of violent crime to be around 11.28 billion British Pounds (using the higher QALY value of 81'000 Pounds).

worry of victimization.[46] And productivity losses might result from time and energy spent on activities or emotions linked to anticipating potential victimization of a wide public (Dolan and Peasgood 2007).

At the same time, fear is also a useful sentiment, acting as a natural or inborn defense mechanism in specific situations and for certain people. By stimulating individual precaution and self-protection, a certain level of fear of crime is functional in the sense of stimulating wariness, thereby lowering actual victimization risks.

[46] Disentangling these two distinct intentions or preferences proves to be very difficult. Dolan and Peasgood (2007) mention such problems associated with a hedonic pricing model relating to property areas with differing levels of burglary provided by Gibbons (2004).

2.3 Theoretical Framework and Underlying Concepts

Measures of reported subjective well-being such as life satisfaction in general and fear of crime in specific do not solely reflect anticipated, 'expected utility'-considerations, but also anticipatory feelings.[47] One critical aspect of the fear of crime concept is the range of affective (emotional) and cognitive processes that are being evoked in individuals. In an attempt to structure these various aspects of subjective security-related perceptions, we focus on three aspects of potentially relevant information that might be considered by the individual:

(a) Possible security-related *events* or forms of victimization (*What could happen to me?*);

(b) physical, material and mental *consequences* of being victimized (*How will it affect me?*); and

(c) the concrete *probability* of being victimized (*How likely will it hit me?*).

Both cognitive and affective components are part of individual welfare judgments and, therefore, need to be considered when analyzing subjective perceptions of public security. Separate from these subjectively felt or evaluated aspects, theoretically, there is an 'objective risk' of a specific individual (accounting for all of that person's characteristics), which is unobservable in reality and not identical to figures represented in official crime statistics for disaggregated sub-populations.

Ordered by the amount of information available and considered in a subjective cognitive evaluation, different forms of security-related concepts can be classified as shown in Table 1. Jackson (2005) finds in his empirical study that respondents treat 'worry', 'perceived likelihood of victimization', 'perceived ability to control the probability of victimization', 'perceived severity of consequences', and 'beliefs about the local incidence' of crime as distinct things. Still, these conceptual terms are not as distinctively and clearly separable as this illustration might suggest.

Table 1: Security-Related Concepts

	0%.....	**Cognitive** component in subj. evaluation		……100%	**Objective Evaluation**
	100%.....	**Affective** component in subj. evaluation		……0%	
Possible Events:	N	Y	Y	Y	
Consequences:	N	N	Y	Y	
Probability:	N	N	N	Y	
Related Psychological Concepts:	Anxiety *Anticipatory*	(Uncertainty) *Anticipatory*	Uncertainty or Worriedness *Anticipated*	Subjective Risk Perception *Anticipated*	Objective Individual Risk
Security-Related Terms (used in Criminology):	**'Insecurity'**		**'Fear of Crime'**	**'Subjective Victimization Probability'**	
Possible Measurement Instruments:	Physiological Measures (mostly)		Surveys (and Physiological Measures)	Victimization Surveys	Not Avail. in Crime Stats; Approx. by Vict. Surveys

Note: 'N' means 'not considered by the individual'; 'Y' means 'considered by the individual.'

[47] On the difference between *anticipatory* feelings (emotional states, not a reaction to outcomes) and *anticipated* feelings (such as 'risk perception'), see, e.g., Caplin and Leahy (2001), Sacco (2005), and Eliaz and Spiegler (2006). As an example from the labor market, where general unemployment seems to particularly affect negative feelings from economic insecurity of those working in the private sector, see Luechinger et al. (2008).

The term *'insecurity'* is used for an anticipatory feeling about life circumstances and possible threats reflecting, e.g., conscious or subconscious anxiety.[48] 'Anxiety' can appear (and have an impact upon experienced utility) in a purely emotional form, i.e. without any cognitive elements intervening. Therefore, anxiety describes a broad, diffuse or 'ambient' feeling about public security.[49]

The term 'uncertainty' was prominently introduced in economics by Knight (1921/2005), who distinguished it from 'risk'. In his understanding, 'uncertainty' refers to a situation when randomness cannot be expressed in terms of mathematical or statistical probabilities (in contrast to 'risk'). More recent interpretations of Knight's 'uncertainty' suggest that the concept does not depend upon the extent of subjective probabilities people have, but instead he informally referred to market failure situations due to moral hazard or adverse selection (LeRoy and Singell 1987).

While anxiety and general insecurity are hardly measurable by stated preference approaches such as surveys, they can be indirectly elicited by observing physiological correlates. Physiological correlates of anxiety might be similar to those of happiness: Potentially useful are cardiovascular measures such as the heart rate in Beats per Minute (BPM), blood pressure (hypertension) or mental strength (weakness) in the widely used General Health Questionnaire (GHQ).[50]

In contrast to anxiety (and subjective feelings of insecurity), *'fear of crime'* contains anticipatory as well as anticipated elements and is, therefore, a more cognitively oriented concept relating to a specific type of crime and its consequences.[51] Hough (2004) distinguishes between fear as a mental event and anxiety (or worry) as a mental state, and argues that when dealing with anxiety (or worry), its intensity is more relevant than its frequency, because it is not reducible to discrete mental events.). The concept of 'fear of crime' represents the everyday moments of alarm or worry caused by an awareness of danger and by feeling personally threatened.[52]

Anticipated *'subjective victimization risk or probability'* not just accounts for the mere possibility and the potential consequences, but also for the (perceived) likeliness of becoming a victim of a specific crime. As a consequence, this cognitive aspect of security-related attitudes does include general assessments of the size of the crime problem,[53] the perceived likelihood of falling victim, estimations about the seriousness of the related consequences as well as a sense of control ('self-efficacy') over the individual victimization probability (Jackson 2009).

However, there is still a (slight) affective component remaining in cognitive probability evaluations, e.g., even when one considers the conscious exertion of risk when participating in a lottery. Finally, subjective probabilities are merely subjectively assigned expressions of beliefs and do not necessarily correspond to the 'true' distribution of randomness in reality.

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48 Whether or not the mere chance of victimization is in one's own subjectively perceived possibility set – termed 'ipsative possibility set' (IPS) by Frey (1988) – determines whether the associated feelings are closer to 'anxiety' or to the slightly more cognitive concept of 'uncertainty'.

49 On anxiety, see, e.g. Spielberger (1972), Hollway and Jefferson (1997) or Lee and Farrall (2008). Anxiety in the area of health care is analysed in Koszegi (2003).

50 There is a growing literature on neural and physiological correlates of well-being and anxiety, e.g., Lane et al. (1997), Waldstein et al. (2000), Urry et al. (2004), Klein (2006), and Blachflower and Oswald (2008).

51 On the measurement approaches with regards to fear of crime (and subjective insecurity), see section 2.2.2.

52 Interestingly, there is some evidence that certain people, e.g. women, are more willing to express ('admit') their worries and vulnerabilities than, e.g., males (Sutton and Farrall 2005).

53 For example, the Gallup Poll has shown that respondents in the United Stated think crime has decreased in the last three decades (Vanderveen 2006).

It is a priori unclear in how far these concepts correspond to each other.[54] There are also possible mechanisms by which 'cognitive considerations' feed back on 'emotional responses' and vice versa. These feedback loops might be relatively stronger for people who judge the consequences of crime to be grave and their own self-efficacy to be low (Warr 1987). Both cognitive and affective dimensions of fear of crime can express or manifest in behavioral reactions, e.g., if people avoid walking through certain areas or take specific preventative measures.

We conclude that subjective perceptions of insecurity and fear of crime do not exclusively reflect expected-utility considerations and differ from traditional approaches to risk analysis as well as from more recent psychological approaches to risk perception. Regarding the latter category, there have been a few approaches towards a 'psychologically enriched' expected utility concept.

Analyzing the economic consequences of Festinger's (1957) theory of cognitive dissonance, Akerlof and Dickens (1982) propose that by influencing their own subjective beliefs, people also induce chances in their utility. Anticipatory feelings were introduced to expected utility theory, e.g., by Caplin and Leahy (2001) showing in a theoretical model how such feelings may result in time-inconsistent behavior.

Similarly, the 'risk as feelings'-hypothesis (Lowenstein et al. 2001) highlights that emotional responses to uncertain and risky situations (a) can diverge from cognitive assessments and (b) often offset the former in driving behavior. In an attempt to balance cognition- and affect-based approaches to risk research, Slovic et al. (2004, p. 320) conclude: "Because risk as feelings tends to overweight frightening consequences, we need to invoke risk as analysis to give us perspective on the likelihood of such consequences."

Becker and Rubinstein (2004) suggest that people have the possibility to handle their fears by investing in (or 'accumulating') mental capital. We emphasize that subjective attitudes such as fear of a specific type of crime and broader feelings of insecurity enter the utility function via an impact on presently experienced utility.

In addition, security-related perceptions are also assumed to influence subjectively perceived victimization risk via the individual sensitivity to signs of public disorder and police presence. Equilibrium considerations suggest that fear and anxiety simultaneously stimulate behavioral adaptations such as self-preventative measures. In this manner, informational aspects, considered in an individual's anticipated victimization probability, are conceptually separated from emotional aspects influencing currently experienced utility.

[54] Therefore, fear of crime is often defined as an amalgam of the described concepts: "Here, the fear of crime is defined as a set of empirically distinct but related constructs that combine emotion, risk perception and vulnerability (…)" (Jackson 2005, p. 300).

2.4 Hypotheses

2.4.1 Victimization Risk and Vulnerability

A core objective of this analysis of public security is to study potential factors that determine the fear of crime and indirectly shape security demand in a modern democracy. From a rational choice perspective, by influencing subjective perceptions of risk, some assessment of the probability of becoming a victim of crime is an obvious factor in explaining fear of crime (Ferraro 1995). Consequently, our first main hypothesis is as follows:

> *Hypothesis 1: Victimization Risk*
> People are expected to be more fearful of crime if their (statistical) risk of victimization is relatively high (ceteris paribus).

In addition, aspects of vulnerability are also expected to drive risk perception, such as a sense of one's own potential to handle criminal offenses or an evaluation of probable consequences (Jackson 2006, 2009). Until recently, efforts to explain the fear of crime had been dominated by sociological research focusing on vulnerability-relevant variables such as gender, age, income, household composition, length of residence, the size of social networks, participation in non-domestic activities (work or study) etc. (Farrall et al. 2000).

Although these models have largely ignored (social) psychological factors,[55] they were statistically powerful in explaining fear of crime (id.). Thus, mainly two factors are hypothesized to shape fear of crime besides subjective valuations of the likelihood of victimization (Tallis and Eysenck 1994, Jackson 2005): Perceptions about the consequences of and control ('self-efficacy') over potential victimization.

The underlying theoretical reasoning has been expressed by the vulnerability thesis (e.g. Bandura 1986, Killias 1990, Jackson 2009) underlining, e.g., the social psychological model of fear of crime (Van de Wurff et al. 1989). It suggests that especially women and older people (and, to some extent, those with fewer financial resources) feel themselves to be less capable of defending against criminal infringements and, consequently, are more fearful.[56] Broad evidence for the European Union member countries support the finding that women and elderly people are the demographic groups who are most likely to feel insecure.[57]

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[55] The social psychological model originally proposed by Van der Wurff et al. (1989) associates – without assuming causal orderings or relations – fear of crime with the following four 'factors': Target 'attractivity', 'evil intent' of potential criminals, 'power' to defend oneself, and 'criminalizable space'.

[56] It is unclear, how income correlates with fear of crime, because – from an equilibrium perspective of analysis – a higher income directly increases but indirectly may also decrease target attractiveness, because people with more financial resources can also take more preventative measures.

[57] For the respective Eurobarometer survey results, see Hartung (2001), Christensen (2002), and Reif and Marlier (2002).

Hypothesis 2: Vulnerability

Individuals are more fearful if they are more vulnerable to crime: Accordingly, women are expected to be more fearful than men and the elderly to be more fearful than young people.

Still, the exact relationship between fear of crime and age has long been subject of controversy and might not be obvious ex ante: While most studies have regarded young people as relatively fearless (e.g. Tulloch 2000), some have indicated that they are more fearful than the elderly – consistent with most official crime statistics (e.g. Ferraro and LaGrange 1992, LaGrange et al. 1992, Ditton et al. 1999b, Chadee and Ditton 2003). Moore and Shepherd (2007) find inverted u-shaped relationships between fear of crime and age – with maximums at 45 years of age for property crimes and 23 years of age for violent crimes.

2.4.2 Disorder and Police Perception

Fear of crime might not only (if at all) be determined by perceived risk or vulnerability, but also by subjective interpretations of the social and physical environment more generally (Girling et al. 2000, Innes 2004). Signs of public disorder and incivilities can act as cues referring to crime and, therefore, signal a risky and potentially dangerous environment. Disorderly and disreputable conditions are visible signs for the health of a community and its ability to cope with the crime challenge.

Biderman et al. (1967) already suggested that incivilities, i.e. behavioral improprieties, signal information about local crime incidence and the threat of victimization. Thus, they may be seen as indicators for social disorganization and threat to an individual's well-being and identity, although these behaviors per se need not be illegal (Maxfield 1984, Bannister 1993). LaGrange et al. (1994, p. 311) formulated that incivilities are interpreted as "(…) low-level breaches of community standards that signal an erosion of conventionally accepted norms and values."

For more than two decades, an increasing amount of empirical research has been devoted to the influence of neighborhood disorder and incivilities on fear of crime (e.g. Skogan 1992, Perkins and Taylor 1996, Robinson et al. 2003, Sampson and Raudenbush 2004, Moore and Shepherd 2007, Wyant 2008). The idea that policing involves a steady development and expansion of the police mandate is fundamental in modern problem-oriented policing (Skogan and Hartnett 1997). Jackson (2005) suggests that perceptions of the environment shape people's worry about crime by changing their beliefs about the local incidence of crime and their personal vulnerability.

A wide range of potential problems has been labeled as 'disorder', e.g. (Skogan 1990): Abandoned buildings or cars, broken windows, dirty streets and sidewalks, graffiti, litter and trash, loitering, loud parties, noise, unsavory businesses such as pornographic cinemas or topless bars, public drinking and drug use, vandalism, etc. Incivilities are usually attributed to either 'social' and 'physical' disorder (e.g. Shepherd 1999), but it is not clear which of these categories are relatively more troubling to individuals (Taylor 1999). The following empirical analysis (sections 2.5 and 2.6) will also address this issue.

In sum, everyday issues might symbolize or signal information about crime risks, conditions conducive to crime, a lack of conventional courtesies, a community's and local authorities' unwillingness to manage these problems, increasing diversification of norms and values, or an erosion

of trust, reciprocity, respect and social order – factors that finally generate a sense that the situation is out of control in the local environment (e.g. Hunter 1978, Lewis and Maxfield 1980, Donnelly 1988, Smith 1989, Goldstein 1990, Bannister 1993, Ferraro 1995, Stephens 1999, Innes and Fielding 2002, Jackson 2005, 2008). Thus, incivilities and disorder can drive subjective fear of crime as reflected in Hypothesis 3.[58]

> *Hypothesis 3: General Disorder*
> If there are visible signs of disorder and incivilities present in an individual's neighborhood, they may signal a lack of control and thus convey fear of crime.

Whether this kind of information processing is rational or not needs to be analyzed by relating signs of disorder to victimization risks. According to the Broken-Windows approach (Wilson and Kelling 1982) first adopted in the United States policing practice, prevalent disorder can actually come along with a climate of fear, self-selection of dubious people into that neighborhood, and finally lead to higher levels of crime.[59]

Alternatively, people may use the incorrect assumption that signs of physical disorder are a good actual predictor of property crime rates. According to the Incivilities Hypothesis, if there is (a relatively high amount of) disorder observed in a neighborhood, these environmental conditions are conducive to crime in the sense of victimization rates in that area (Taylor 1999). In a short digression, the correlation between disorder and victimization rates across neighborhoods is being studied.

It remains unclear, in how far people use the language of 'fear of (or worry about) crime' to express concerns about neighborhood incivilities or the loss of social capital – or, vice versa, whether fearful people simultaneously perceive more incivilities in their living area (Jackson 2008, Farrall et al. 2009). Sampson and Raudenbush (2004) found that racial and economic context matters more than independently observed disorder in explaining subjectively perceived disorder.

They conclude that expressions of 'disorder' and 'incivilities' are to a significant extent socially constructed. Individual differences in perceived incivilities are strongly correlated with differences in the subjective levels of fear of crime (Taylor 1999). Consequently, it is not an effective empirical strategy to try identifying 'effects' of neighborhood incivilities on (subjective) fear by exclusively considering subjective perceptions of the environment.

"We do not yet have studies simultaneously examining impacts of individual and community perceived incivilities while controlling for local crime or victimization rates and individual victimizations. (…) We do not yet have studies using the same indicator that compare individual and contextual disorder impacts" (Taylor 1999, p. 73/74). In the present study's empirical analysis, more measures of aggregate or average disorder are identified and controlled for.

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[58] Referring to the pioneering work by Skogan (1990), Taylor (1999, p. 72) summarizes: "Skogan, by contrast, explicitly anticipates that incivilities will make independent contributions to neighborhood change, net of neighborhood structure and, presumably neighborhood crime, although indicators for the latter were not available in his data set." Here, it will be possible to scrutinize this suggestion, controlling for local crime as well as victimization – both aspects were not included as predictors by Skogan (1990).

[59] Skogan (1999) reports that there is some evidence of a relationship between efforts to control disorder, the level of citizen fear, and reported crime in the cities of Houston (TX), Newark (NJ), New York (NY), and St. Petersburg (FL). Furthermore, "disorder management is becoming a higher priority in many cities" (id., p. 59).

More recent research from Farrell et al. (2009) reveals that broader anxieties about social change may shift tolerance levels regarding ambiguous cues of disorder in the environment. For example, people with more authoritarian views about law and order might be more likely to see disorder in the same environment than more 'liberal' individuals. In addition, they might also link these stimuli more often to problems of social control and quality of life in the respective areas.

From an empirical perspective, the idea that people who perceive more disorder are, at the same time, more concerned about their security, has been repeatedly supported (Lewis and Maxfield 1980, Covington and Taylor 1991, Wilcox Rountree and Land 1996, Taylor 1997). However, these studies regularly do not control for the local victimization rates when analyzing the contribution of perceived incivilities on the level of fear (Taylor 1999) – these control variables are integrated in the empirical test of Hypothesis 4.

Hypothesis 4: Individually Perceived Disorder
It is not (only) the average disorder visible in a neighborhood that correlates with fear of crime, but merely the subjectively perceived disorder.

The signaling argument formulated in the derivation of Hypothesis 3 has led to the suggestion that tackling social and physical signs of disorder may effectively remove some of the stimuli to public inferences about the incidence of crime and, thereby, reduce fear of crime (Innes 2004, Innes et al. 2004). Thus, individuals may interpret formal ways of (social) control such as visible policing as signals for social order.[60] Skogan (1999, p. 51) noted that there had been no research addressing the accuracy of police visibility measures, and that "remarkably little attention has been focused on developing measurements of public assessment of police service."

Police presence is an essential element of modern forms of community-oriented policing which consists of personal conversations, foot patrols, alley checks, etc. (Greene and Mastrofski 1988, Goldstein 1990, Skogan 1999). While the visibility of police patrols on the street is actually intended to reduce crime risk and its perception (fear of crime), it could also stimulate fear of crime by signaling the presence – or the possibility of – danger (Stephens 1999).[61] Hypothesis 5 concentrates on visible police presence.

Hypothesis 5: Police Presence
The higher the visible presence of police patrols in a neighborhood in general, the lower the residents' fear of crime.

The correlation between neighborhood police presence and victimization risks is swiftly studied as well. Furthermore, in analogy to the arguments underpinning Hypothesis 4, subjective perceptions of police might drive the correlation between police presence and fear of crime.

[60] Civic liberty issues at stake when police force is used, in liberal and increasingly diverse societies, in order to counteract mere nuisance or public annoyance are not considered here (see, e.g., Jackson 2005).

[61] Skogan (1999) presents some scattered evidence that police presence reduces fear of crime for all ethnic groups analyzed.

Hypothesis 6: Subjective Perception of Police Presence

It is not the average police visibility in a neighborhood that correlates with fear of crime, but merely the subjectively perceived police presence.

2.4.3 Victimization Experience Hypothesis

According to early research and models of fear of crime, victimization experiences have clear effects on various fear of crime measures (e.g. McGarrell et al. 1997, Skogan 1999, Bannister and Fyfe 2001). This might be the result of a mixture of cognitive and affective processes and can lead to a de-biasing or re-biasing of estimated victimization risks and fear (Chadee et al. 2007).

According to the availability and representative heuristics, individuals might infer from singular experiences to a general situation (also by 'stereotyping') or they put too much weight (or confidence) on small sample outcomes and make corresponding inferences to everyday life (Kahnemann et al. 1982, Heimer 1988, Kahnemann and Fredrick 2002).

"(O)ther evidence suggests that people with a greater experience of constant and extreme risks may be less concerned" (Barnett and Breakwell 2001, p. 76). This mirrors in the so-called 'fear-victimization paradox' (Lindquist and Duke 1982), i.e. that those most likely to be victimized (young men) have relatively low fear levels (Garofalo and Laub 1978, Skogan and Maxfield 1981). This might result from an optimism bias (Weinstein and Klein 2002) or a bias of overconfidence (Griffin and Tversky 2002),[62] and can lead individuals to apply cognitive risk neutralizing strategies (Furedi 1998, 2006).

However, so far, there is little evidence that unrealistic optimism is detrimental (Armor and Taylor 2002). An alternative suggestion in the literature states that the paradox results from biased reporting in the sense that men and young people understate their levels of fear and that some types of crime (e.g. sexual assault) are often not reported (Baur 2007).

Hypothesis 7: Individual Victimization Experience

Fear of crime is driven by one's own past victimization experiences.

[62] However, the overconfidence bias can basically work in both directions, i.e. overconfidence in future resistance *or* in one's own experiences.

2.5 Data and Empirical Methods

2.5.1 Local Context and Data Source

The evidence analyzed in this study is on public security in an urban area of a relatively secure country: Our data is for the city of Zurich in Switzerland. On December 31, 2007, there were 377'000 residents living in Zurich, which is the largest urban area, and the main commercial and cultural centre in Switzerland and the capital of the canton of Zurich (City of Zurich 2008). According to various large-scale surveys in recent years, Zurich has been named the city with the highest living standard and second-to-highest level of 'personal safety'[63] worldwide (Mercer Human Resource Consulting 2008).

There is a growing literature on spatial aspects of crime showing, e.g., that crime as a social problem is especially virulent in (sub-)urban areas(Glaeser and Sacerdote 1999, Zenou 2003). In addition, the Eurobarometer results support the finding that, for almost every 'old' member state of the European Union, fear of crime is higher in large towns than in rural areas (Hartung 2001, Christensen 2002, Reif and Marlier 2002). This finding was previously reported by Wilson (1968) and Lee (1981), and it was also found by Bannister and Fyfe (2001).

The city of Zurich is divided into twelve municipal districts (*German: Wohnkreise*), each containing 2, 3 or 4 (in total: 34) neighborhoods or 'quarters' (*Wohnquartiere*) (City of Zurich 2008). The following map (Figure 1) illustrates Zurich's twelve districts (id., Wikipedia: The Free Encyclopedia 2009). The districts and the corresponding subdivision into neighborhoods are shown in more detail in Figures A.1 and A.2 in the Appendix.

The market and opinion research institute Isopublic Inc., on behalf of the City Police of Zurich, has conducted three large, representative telephone-based (CATI) surveys; the Zurich Crime Survey. These survey waves have been implemented in 2004, 2006, and 2008 (each conducted in February/March within around 2 weeks).

Per wave, 2'400 people were surveyed, totaling 7'200 observations. Individuals were asked about fear of crime, perceived subjective security, actual endangerment and victimization. This high quality survey data simultaneously includes information on self-protection behavior, police presence and individually observed signals of disorder or incivility.[64] The number of observations per district is described in Table 2.

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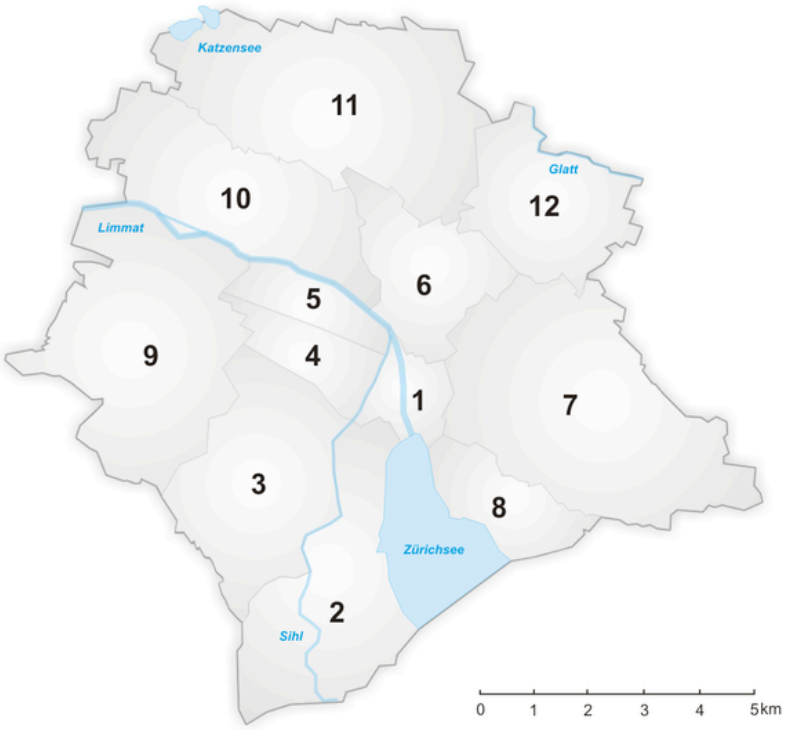
[63] The personal safety ranking is based on internal stability, effectiveness of law enforcement and relationships with other countries. Luxembourg was rated the most secure urban area, followed by Zurich, Berne, Geneva, and Helsinki all equally placed at number two. Baghdad was the world's least safe city from 215 cities rated.

[64] The questionnaire is state of the art and was worked out in collaboration between the Zurich City Police and Martin Killias, a leading criminologist at the University of Zurich (e.g., see Killias et al. 2007). The whole questionnaire (in German) is available on request from the author.

Figure 1: City Districts in Zurich (Switzerland)



Source: Wikipedia: The Free Encyclopedia (2009)

Table 2: City of Zurich – Inhabitants (2006) and Total Sample (2004-08), per District

District	**Inhabitants**		**Sample**	
	total	*relative*	*total*	*relative*
1	5'608	1.52%	114	1.58%
2	28'898	7.81%	567	7.88%
3	45'887	12.40%	883	12.26%
4	26'705	7.22%	440	6.11%
5	12'722	3.44%	224	3.11%
6	29'657	8.01%	584	8.11%
7	34'421	9.30%	689	9.57%
8	15'207	4.11%	295	4.10%
9	46'143	12.47%	919	12.76%
10	36'409	9.84%	757	10.51%
11	59'868	16.18%	1'168	16.22%
12	28'537	7.71%	560	7.78%
Total	**370'062**	**100.00%**	**7'200**	**100%**

Source: Zurich Statistics Office, Zurich Crime Survey.

2.5.2 Relevant Variables and Descriptive Statistics

Fear of Crime:

The items used in the questionnaire ask directly about a person's fear of specific types of crime:[65] "How big is your personal fear of becoming a victim of the following types of (criminal) offenses?" Respondents answer on a scale of 1 to 4, where 1 means "very afraid", 2 "a little afraid", 3 "almost unafraid", and 4 "not afraid at all". This scaling has become very popular and corresponds, e.g., to the one used in the British Crime Survey (Kershaw et al. 2001, Moore and Shepherd 2007). The included offense categories, for each of which the level of fear was asked, are

- insult (libel),
- harassment,
- threat
- physical violence, and
- rape.

These five offense types were categorized as *'violent crimes'*, whereas the following five offense types were summarized as *'property crimes'*:

- Confidence trick,
- theft,
- vandalism (against one's property, e.g. graffiti),
- car theft, and
- burglary.[66]

This categorization of specific crimes into 'violent' and 'property crime' is suggested by recent literature. Although the distinction between and reducibility to 'personal' and 'property' crime has repeatedly been suggested (e.g. Ferraro and LaGrange 1992, Kershaw et al. 2001, Chadee and Ditton 2003), most studies have traditionally treated fear of crime as a monolithic construct focusing on broad insecurity items such as 'how safe do you feel walking around your neighborhood at night?' (Moore and Shepherd 2007).

Jackson (2005) employs confirmatory factor analysis (CFA) to analyze whether particular survey questions asking for the fear of a specific type of crime scale to form adequate constructs. In chi-square tests, he finds that the two-factor model, dividing the specific indicators into 'property' and 'personal' crime, is a statistically significant improvement over the one-factor solution in terms of the approximate fit statistics.[67]

Using the British Crime Survey data, Moore and Shepherd (2007) also demonstrate that fear is reducible to these two contexts, which they term 'fear of personal loss' and 'fear of personal harm'. Analyzing Spearman correlation coefficients between eight different fear questions and by performing factor analysis, they find that the items loading heavily on factor 1 are related with a high probability of

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[65] Alternatively, researchers sometimes rely on vignettes to describe complex social contexts and elicit fear-related information (e.g., see Van de Wurff et al. 1989),

[66] Although burglary may also has some characteristics of a 'personal' or 'violent' crime, its factor loading clearly implies that it is attributable to the category 'property crimes' (Jackson 2005).

[67] These two latent aggregates have convergent and divergent factorial validity (Byrne 1981). Moreover, they seem to be stable across gender and geographic areas. On the evaluation of structural equation models in general, see Fornell and Larcker (1981), and the critical discussion provided by Bagozzi (1981).

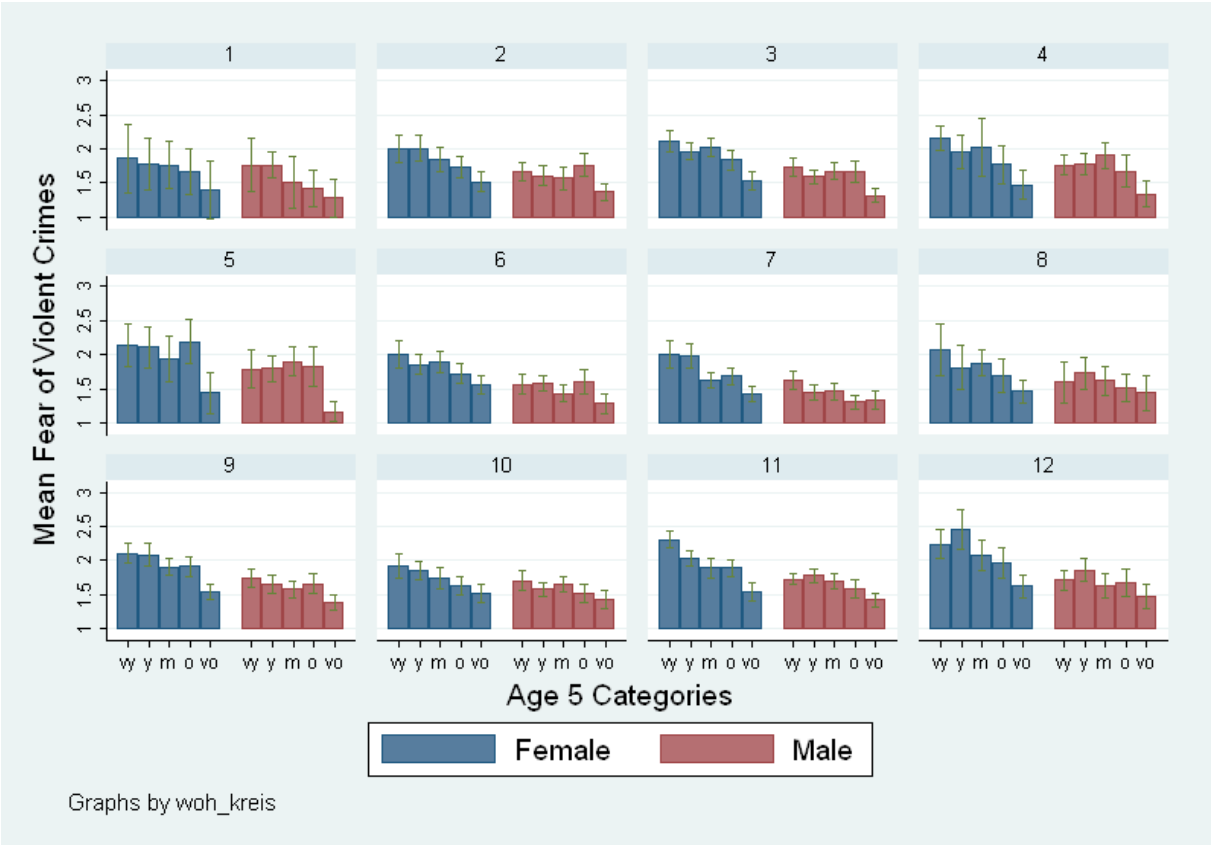
personal harm but a low probability of property loss and vice versa for those items loading on factor 2 (id.).

Shepherd and Moore (2007, p. 160) conclude: "On the basis of these findings, which are consistent with previous qualitative findings from England and Wales, fear of crime should not be considered to be a monolithic construct and the causes and correlates of fear should, in future, be considered in terms of 'fear of personal loss' and 'fear of personal harm' separately. (…) From the policy perspective, efforts to reduce fear need not address more than these two categories."

Consequently, the two dimensions – 'property' crime and 'personal' (or, as it is named here, 'violent') crime – are related but empirically discernible. Furthermore, when studying subjective perceptions of victimization risks and corresponding self-efficacy as well as beliefs about the local incidence of crime, again, these measures have good scaling properties and two-factor models fit the data well (Jackson 2005). This implies that respondents generally judge 'property' and 'violent' crimes differently, and that they perceive specific crimes as belonging to one of these two domains.

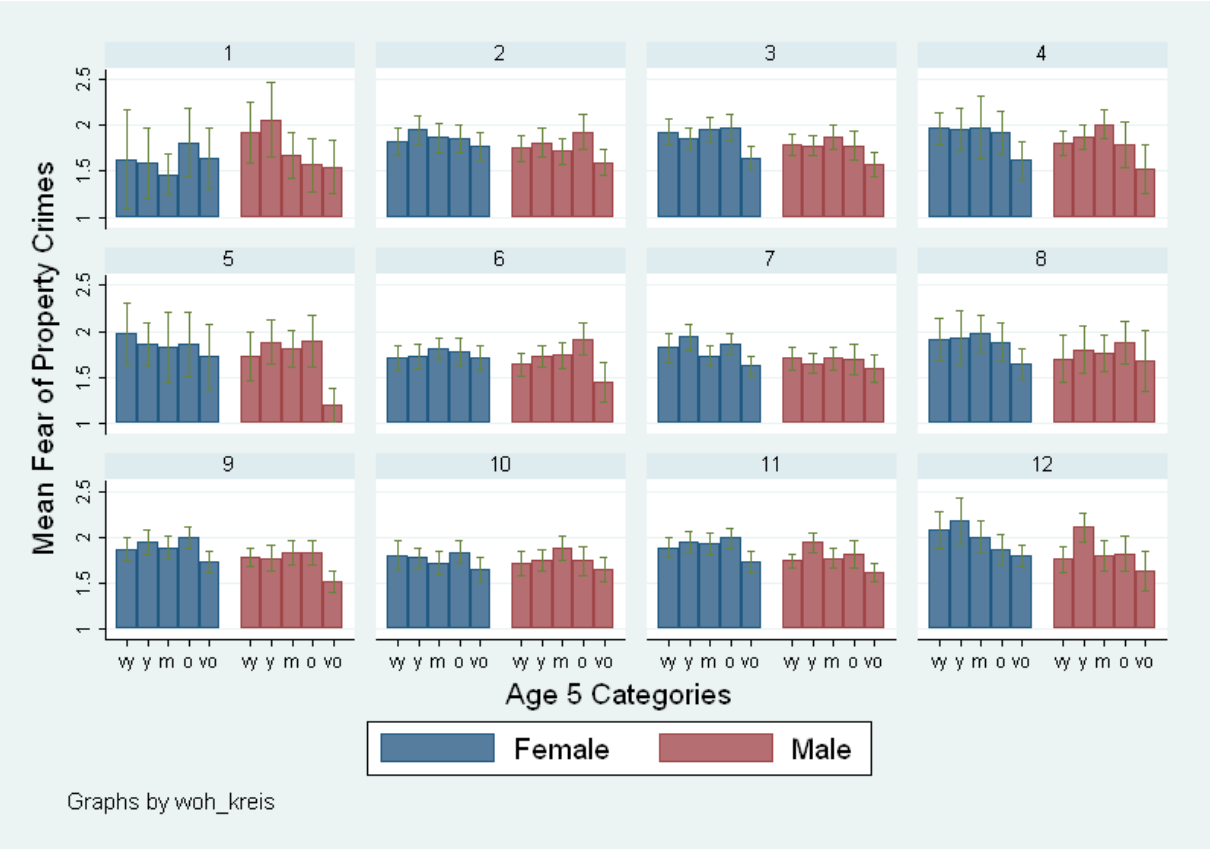
The sample distribution of the fear of violent and property crime, respectively, is displayed in Figures 2 and 3. For each of the twelve city districts, average fear of crime (when the scale is cardinally interpreted) and 95%-confidence intervals are displayed separately for women (blue) and men (red) as well as for five age categories – 'very young' (vy, <31 years of age), 'young' (y, 31-41), 'middle' (m, 42-53), 'old' (o, 54-67), and 'very old' (vo, >67) – with each age-group containing approximately 20 per cent of all observations in the sample. As outlined above, respondents answered on a scale ranging from 1 (not fearful at all) to 4 (very fearful).

Figure 2: Distribution of the Fear of Violent Crime (Across Districts, Gender, Age-Groups)



Source: Own calculations based on Zurich Crime Survey.

Figure 3: Distribution of the Fear of Property Crime (Across Districts, Gender, Age-Groups)



Source: Own calculations based on Zurich Crime Survey.

In the Zurich Crime Survey sample, the average fear of crime (regarding either of the two crime types) is 1.767 (standard deviation: sd=.570). Mean fear of violent crime is 1.729 (sd=.662) and mean fear of property crime is 1.804 (sd=.597) across the whole sample. Women report higher fear of crime levels than men: Fear of violent crime is 1.839 (sd=.708) on average for women and 1.617 (sd=.586) for men; fear of property crime is 1.843 (sd=.606) and 1.763 (sd=.583), respectively. Mean fear of violent and property crime, respectively, are displayed by age category and city districts in Tables 3 and 4.

Table 3: Fear of Crime in Zurich, by Age Category

Age Category	**Fear of Violent Crime**		**Fear of Property Crime**	
	mean	*std. dev.*	*mean*	*std. dev.*
14-30 years ('very young')	1.888	0.673	1.809	0.561
31-41 years ('young')	1.816	0.654	1.859	0.593
42-53 years ('middle')	1.761	0.655	1.837	0.585
54-67 years ('old')	1.718	0.659	1.865	0.624
68-97 years ('very old')	1.461	0.588	1.647	0.593
Total	**1.729**	0.662	**1.804**	0.597

Note: Each age category contains approx. 20% of the observations in the sample.
Source: Own calculations based on Zurich Crime Survey.

Table 4: Fear of Crime in Zurich, by City District

District	Fear of Violent Crime		Fear of Property Crime	
	mean	*std. dev.*	*mean*	*std. dev.*
1	1.609	0.538	1.686	0.523
2	1.706	0.635	1.813	0.590
3	1.750	0.667	1.817	0.613
4	1.817	0.721	1.866	0.642
5	1.863	0.656	1.808	0.650
6	1.664	0.598	1.731	0.544
7	1.590	0.588	1.733	0.535
8	1.662	0.642	1.816	0.629
9	1.758	0.691	1.816	0.607
10	1.641	0.609	1.747	0.565
11	1.793	0.672	1.839	0.593
12	1.837	0.757	1.888	0.647
Total	**1.729**	0.662	**1.804**	0.597

Source: Own calculations based on Zurich Crime Survey.

Socio-Economic Variables:

Most of the variables that have been included in socio-demographic models analyzing fear of crime[68] have been elicited by the questionnaire:

a) *Gender:* Gender is coded as a binary variable that equals unity if the individual is male. 51.3 per cent in the sample were females.

b) *Age:* The age of respondents is coded as an integer (natural number) variable, i.e. not categorized (the average age in the total sample was 49.9 years). Previous research on fear of crime has often considered age categories as an ordinal variable (Moore and Shepherd 2007). One problem raised by this approach is the arbitrary choice of group thresholds. The definitions of specific age groups[69] vary significantly across numerous studies (Chadee and Ditton 2003) and this has led to conflicting results about the relationship between fear of crime and age (Baur 2007).

   Empirical observations suggest a non-linear, i.e. invertedly u-shaped relationship between fear of crime and age (Ferraro and LaGrange 1992, Chadee and Ditton 2003). These latter studies also suggest variation in the relation between age and fear of different types of crime: The fear of *property* crime peaks during middle-age, but the fear of *violent* crime does so much earlier – around the age of 20 years (id.). In accordance with the recent research suggesting a non-linear (quadratic) age-fear-relationship, an age polynomial (age squared) is incorporated in the regression model used here.

[68] For example, Van de Wurff et al. (1989) developed a socio-demographic model more or less representative for sociological research in the field.

[69] Sundeen and Mathieu (1976), e.g., defined 'elderly' as at least 52 years of age while others such as Warr (1984) have chosen 66 years of age or even higher levels.

To generate average values for victimization risks of subpopulations with certain socio-demographic characteristics, age was also categorized in 3 (and 5) categories each containing around 33 per cent (20 per cent, respectively).

c) *Highest educational level attained:* Originally six categories 'elementary/primary school' (*German: Primarschule*), 'high/secondary school' (*Real-, Sekundar-, Bezirksschule*), 'vocational training school' (*Berufsschule*), 'grammar school' (*Mittelschule, Gymnasium, Seminar*), 'university/college' (*Universität, Hochschule, ETH/Poly, HTL, Fachhochschule*), and 'post-graduate' (*Universität Nach-Diplom Abschluss MBA, PhD*) – recoded as a dummy 'high education' if one of the last three answers apply (45.2 per cent of the sample).

d) *Income:* Four verbally formulated answering options – 'low income' (*German: Wenig Bemittelte*), 'lower middle class' (*Unterer Mittelstand*), 'upper middle class' (*Oberer Mittelstand*), 'high income' (*Gutsituierte*) – either included as four binary variables or aggregated to one dummy variable that equals unity if the income level is either 'upper middle class' or 'high' and zero otherwise.[70] 50.0 per cent of the respondents reported an 'upper middle class' or 'high' income.

e) *Household composition:* Binary variable, coded as 'single household' (vs. 'multi-person household'), applying on 28 per cent of respondents.

f) *Occupation:* 11 categories asked in total. The six categories 'self-employed, 'craftsman', 'farmer', 'chief public servant', 'other public servant', 'skilled blue-collar worker', and 'unskilled blue-collar worker' are subsumed as 'paid work'. The other four dummies are 'student/apprentice', 'retired person', 'housewife/-man', and 'unemployed'. Additionally, people were asked whether they work full (30 hours and more per week) or part time.

h) *Nationality/Citizenship:* 13 nationalities were among the surveyed individuals. This was recoded as a binary variable 'foreigner' (vs. 'Swiss').

Individual and Average Victimization:

In order to elicit information about individual victimization experiences, people were asked: "Have you ever been a victim of a criminal act? If yes, what was that?" Respondents were able to give multiple answers, with the same (violent and property) offense category options as in the question about fear of crime. This has the advantage of directly comparable levels of fear and victimization with regard to various specific offense types.

With regard to average victimization, focusing on small geographic units such as neighborhoods seems to be the most promising approach: "We should measure crime, disorder, and fear at the neighborhood level and develop tailored responses to deal with these problems" (Stephens

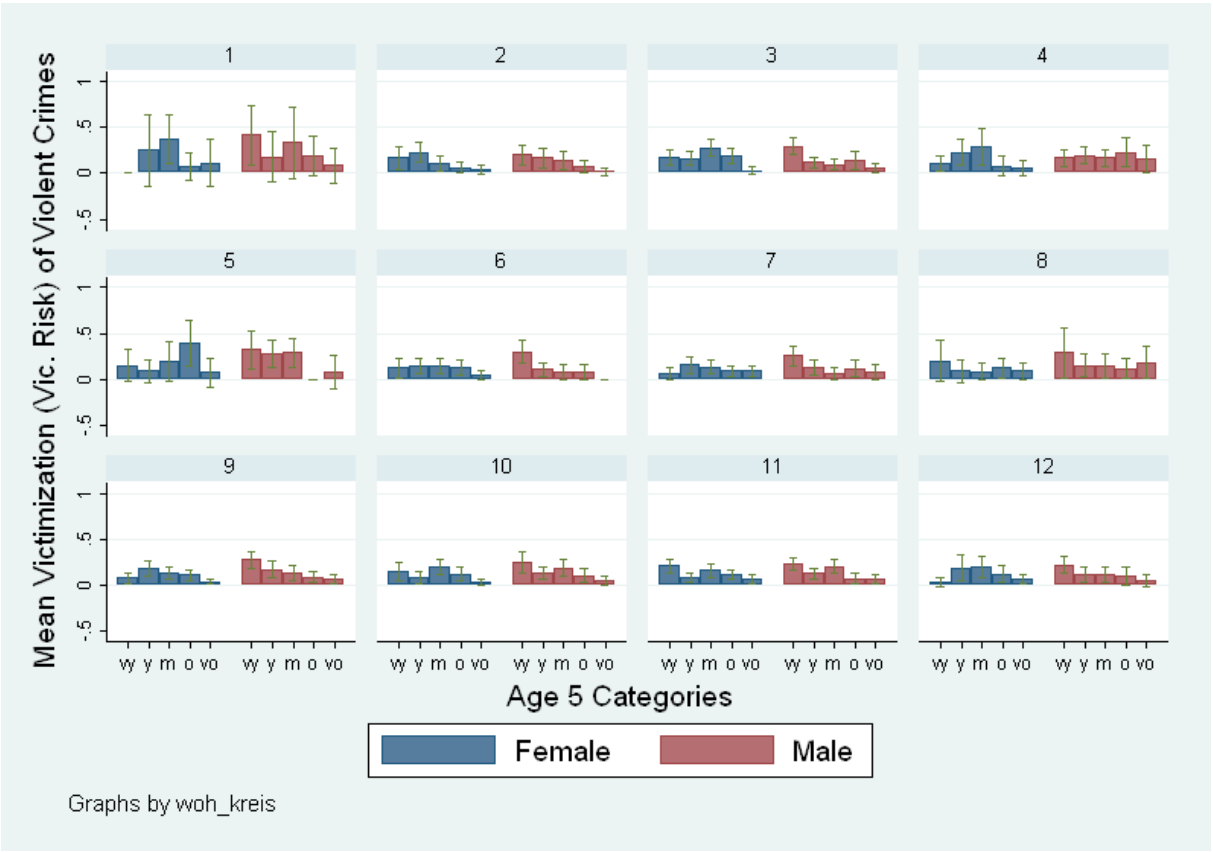
[70] In contrast to the usually very high refusal rates to income questions, e.g. Farrall et al. (2000) report around 20 per cent of respondents refusing to answer this question, the refusal rate in the present survey is only 2.8 per cent.

1999, p. 63). A crucial issue here is the generation of a measure of victimization risk, which is as 'objective' as feasible.

Although it is hardly possible to identify the exact, objective victimization risk of an individual (see the discussion in chapter 2.3), in the following analysis, victimization risk is understood as 'group risk' rather than 'individual risk' (Chadee et al. 2007). This measure has a clear advantage over indices extracted from official crime statistics (see section 2.2), but it must not be disclaimed that it is rather an empirical, averaged approximation for victimization risk than an objective measure of individual risk in strictly theoretical terms.

In analogy to the fear of crime Figures 2 and 3, the sample distribution of the average (group) victimization risks with regards to violent and property crime, respectively, is displayed in Figures 4 and 5. For each of the twelve city districts, averaged victimization risks (including 95%-confidence intervals) are again displayed separately for women (blue) and men (red) as well as for the same five age categories ('very young', 'young', 'middle', 'old', 'very old'). Respondents either have been victimized (1) or not (0).

Figure 4: Distribution of Violent Crime Victimization Risk (Across Districts, Gender, Age-Groups)



Source: Own calculations based on Zurich Crime Survey.

Figure 5: Distribution of Property Crime Victimization Risk (Across Districts, Gender, Age-Groups)

Source: Own calculations based on Zurich Crime Survey.

On average, 45.9 per cent report that they have become a victim of (either violent or property) crime (standard deviation: sd=.498). While 13.4% (sd=.341) have become violently victimized, 35.8% (sd=.480) have become a victim of property crime. Women report victimization with regards to property crime more often (36.8%, sd=.482) than men (34.8%, sd=.477), and vice versa for violent crime (women: 12.2%, sd=.327; men: 14.7%, sd=.354). Victimization rates with regards to violent and property crime, respectively, are displayed by age category and city districts in Tables 5 and 6.

Table 5: Victimization Rates in Zurich, by Age Category

Age Category	**Victim of Violent Crime**		**Victim of Property Crime**	
	mean	*std. dev.*	*mean*	*std. dev.*
14-30 years ('very young')	19.7%	0.398	24.1%	0.428
31-41 years ('young')	14.4%	0.351	40.4%	0.491
42-53 years ('middle')	15.9%	0.366	43.1%	0.495
54-67 years ('old')	11.2%	0.315	40.2%	0.490
68-97 years ('very old')	5.8%	0.234	31.0%	0.463
Total	**13.4%**	0.341	**35.8%**	0.480

Note: Each age category contains approx. 20% of the observations in the sample.
Source: Own calculations based on Zurich Crime Survey.

Table 6: Victimization Rates in Zurich, by City District

District	Victim of Violent Crime		Victim of Property Crime	
	mean	*std. dev.*	*mean*	*std. dev.*
1	21.1%	0.409	43.9%	0.498
2	11.8%	0.323	35.4%	0.479
3	15.5%	0.362	37.5%	0.484
4	16.6%	0.372	29.1%	0.455
5	20.1%	0.402	44.6%	0.498
6	12.2%	0.327	39.9%	0.490
7	11.9%	0.324	40.2%	0.491
8	12.9%	0.336	45.1%	0.498
9	12.1%	0.326	30.7%	0.461
10	12.3%	0.328	37.4%	0.484
11	13.4%	0.341	35.7%	0.479
12	12.0%	0.325	25.9%	0.438
Total	**13.4%**	0.341	**35.8%**	0.480

Source: Own calculations based on Zurich Crime Survey.

Signals of Disorder:

With regards to the environmental perception, the respondents were asked whether they regarded a variety of possible signs of public disorder to be a problem. In order to increase the accuracy and the specificity of self-reports, these questions explicitly focused on the respondent's neighborhood (in analogy to previous literature, e.g. Jackson 2005).

Similar to the categorization of crime types into violent and property crimes, factor analyses have demonstrated that incivilities can adequately be subdivided into 'social' and 'physical' incivilities (id.). Skogan (1999, p. 42) also suggests that "for many purposes, it is useful to think of these problems as falling into two general classes: Social and physical" and he categorizes: "Social disorder is a matter of behavior: You can see it happen or observe direct and tangible evidence that it is a problem. Physical disorder involves visual signs of negligence and unchecked decay." There is some evidence for the city of Chicago (IL) that social disorder issues raise more public concern – reflected in the agendas of beat meetings – than physical disorder (Skogan 1999).

This study relies on a survey measure of disorder, although there is the possibility that responses to such questions are biased in the sense of generally reflecting other preferences and attitudes. However, evidence is available that (a) different socio-demographic groups agree to a great extent in the evaluation of the same neighborhoods and (b) these survey measures strongly correlate to observational data generated by trained observers (Taylor 1999).[71]

[71] There would be alternative approaches to the measurement of public disorder, e.g., the analysis of historical or archival data and observational data generated (Taylor 1999). Perkins and Taylor (1996) and Taylor (1999) pioneered the observational approach to disorder measurement with a careful, block-to-block study of disorder in 66 Baltimore (MD) neighborhoods. However, this approach also has some limitations: Observations are inevitably subjective, underlying standards vary from observer to observer, many observed phenomena may be very brief, transitory, and likely to be missed in non-recurring monitorings (Taub et al. 1984).

Taylor (1999) analyzes discriminant and convergent validity of subjective disorder perception and onsite assessments of disorder, respectively.[72] He finds that although all different versions of the incivility thesis presume that *discriminant validity* has been established (i.e. 'incivilities' refer to a construct different from fear of crime, risk, etc.), *multi-method convergent validity*[73] seems to be more of an issue.

Two central studies (Taylor et al. 1985, Taylor 1995b) suggest that disorder indicators generated by observational assessment are not readily separable from crime and neighborhood structure, whereas perceived incivilities separate clearly from those aspects and other social demographics.[74] According to Taylor (1999) both discriminant and convergent validity speak in favor of survey-based (versus assessment-based) disorder items.[75] Still, there is also some evidence for divergence between observational and survey data on *changes* of incivilities (Giacomazzi et al. 1999, Popkin et al. 2001), complicating the decision for either aggregated survey-based or assessed indicators.

The phrasing of the survey item employed is neutral: "In the proximity of your house or apartment, is there…?" This wording contrasts to more negatively connoted examples like "things that you may think are problems in your neighborhood" in order to capture relatively 'neutral' assessments of the environment. The questionnaire elicits information about the following forms of incivilities or disorders:

- Graffiti;
- littering;
- dubious people;
- run-down houses or street lines;
- nightclubs and 'red-light' bars; and
- traffic noise.

Within this study, traffic noise is not further considered and, mostly, the focus of the empirical analysis will be on the first three signs of disorder (graffiti, littering, and dubious people), which are included separately in the estimation models.[76] In the 2006 survey, there was an additional follow-up question included, asking respondents to give more detailed evaluations of the disorder problem.

For those kinds of disorder that they perceived to be present in their neighborhood, they were asked whether this was a 'very big', a 'relatively big', a 'relatively small', or 'no problem at all'. Because this subjective evaluation is only available for one third of the data set, it was ignored in the present analysis.

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72 On the concept and measurement of validity, see Campbell and Fiske (1959).

73 Of different indicators such as 'individual perceptions of disorder' versus 'averaged survey-based perceptions' versus 'onsite observational assessment'.

74 This examination was performed by exploratory principal-components analysis (see Taylor 1999).

75 Taylor (1999, p. 82/83): "One can argue for aggregated survey responses because those capture residents' current views, subject only to the limitations of the sampling and surveying processes. They provide a snapshot of how residents gauge the problems in the community, and reveal the collective view. (...) If they choose survey-based assessments, they are focusing on an outcome more readily separable from fundamental community fabric. It should be easier to achieve changes on survey-based outcomes than on assessment-based outcomes because the former are somewhat more independent. If they choose survey-based measures, they can more easily argue that incivilities are a problem separate from neighborhood fabric and neighborhood crime and can more easily produce results."

76 Nevertheless, 'graffiti' and 'littering' (as well as 'run-down houses') could be interpreted as 'physical disorder', whereas 'dubious people' (and 'nightclubs / red-light bars') are attributable to 'social disorder'.

For the empirical analysis (section 2.6) of local context effects, these responses were aggregated to district- or neighborhood-level averages of the specific incivility in a certain year. In the Appendix Figures A.3-A.7, the district-average visibility of 'graffiti', 'littering', 'dubious people', 'run-down houses/streets', and 'nightclubs/red-light bars' is presented.[77]

Police presence:

Analogous to the measurement of signs of public disorder, individual perceptions of local police presence, which might be interpreted as a 'sign of public order', were elicited in the questionnaire. Respondents were asked when they saw a police officer in their neighborhood the last time. They were given seven response options: 'Today', 'this (the past) week', 'this (the past) month', 'in the past 2-3 months', 'in the past 6 months', 'in the past year', or 'longer ago'.

For the purpose of a further analysis, a binary variable was generated equaling unity if an individual saw a police officer 'today' or 'the past week' (i.e. 'recently'), which was the case with 52.3 per cent of the respondents. Again, theses measures are also aggregated in the empirical section 2.6 to form district- or neighborhood-level averages of police visibility in a certain year.

Summary of Descriptive Statistics:

Descriptive statistics for the fear of violent and property as well as the main independent variables are provided in Table 7.

[77] The illustrations separate the three survey waves (1994=1, 1996=2, 1997=3) and also differentiate (horizontally) between the twelve city districts. Respondents answered in a binary way (1 means 'sign of disorder is visible in a respondent's neighborhood'). 95%-confidence intervals are also provided in the Figures.

Table 7: Descriptive Statistics of Key Variables (Means, Standard Deviations, Minima, Maxima)

Variable	Mean	Std. Dev.	Min	Max
Male	0.487	0.50	0	1
Age	49.924	19.25	14	97
Age Squared	28.628	19.91	1.96	94.09
High Education	0.452	0.50	0	1
Unemployed	0.024	0.15	0	1
High Income	0.499	0.50	0	1
Foreigner	0.164	0.37	0	1
Single-Person Household	0.280	0.45	0	1
Fear of Violent Cime	1.720	0.66	1	4
Victim of Violent Cime	0.133	0.34	0	1
Victimization Risk Violence	0.130	0.07	0	0.40
Fear of Property Cime	1.808	0.59	1	4
Victim of Property Cime	0.361	0.48	0	1
Victimization Risk Property	0.360	0.10	0.12	0.70
Signal Graffiti	0.402	0.49	0	1
Signal Littering	0.340	0.47	0	1
Signal Dubious People	0.274	0.45	0	1
District Avg. Signal Graffiti	0.397	0.11	0.24	0.86
District Avg. Signal Littering	0.331	0.11	0.10	0.63
District Avg. Signal Dub. People	0.270	0.10	0.10	0.61
Police Presence	0.523	0.50	0	1
District Avg. Police Presence	0.526	0.22	0.22	0.88

Source: Own calculations based on Zurich Crime Survey.

2.6 Results

2.6.1 Crime Statistics and Surveyed Victimization Risks

Public security can be measured by official crime statistics and by (aggregated) victimization survey. For the city of Zurich, Tables 8 and 9 provide an overview of crime statistics and results from recent victimization surveys per city district. To give a sense of the official crime data gathered by the Zurich Police Department and the Statistics Office available, Table 8 presents the number of registered offenses (per inhabitant of the respective district) in the categories 'violence' versus 'property' (aggregated the same way as in the survey data), 'drug,' and 'other offenses' (which are not included in the victimization survey data).

Whereas Table 8 shows police statistical data on the number of criminal incidents per capita and year, Table 9 displays the fraction of respondents (in the respective district) who have become a victim of crime in the past. In addition to the data provided in Table 6, Table 9 displays the fraction of respondents who have become a victim of *either* violent *or* property crime (in the last two columns).

Table 8: Official Crime Statistics in Zurich (per Capita and Year)

District	Violence	Property	Drugs	Others	Total	Violence and Property
1	0.228	2.538	0.337	0.048	3.151	**2.766**
2	0.022	0.124	0.008	0.002	0.156	**0.146**
3	0.025	0.095	0.010	0.002	0.132	**0.120**
4	0.063	0.233	0.120	0.014	0.430	**0.296**
5	0.064	0.388	0.207	0.011	0.670	**0.452**
6	0.025	0.095	0.008	0.002	0.130	**0.120**
7	0.018	0.076	0.002	0.001	0.096	**0.093**
8	0.027	0.143	0.015	0.003	0.189	**0.171**
9	0.026	0.099	0.006	0.002	0.133	**0.125**
10	0.017	0.067	0.009	0.001	0.095	**0.085**
11	0.028	0.116	0.016	0.003	0.162	**0.144**
12	0.020	0.068	0.004	0.002	0.093	**0.088**
Total	**0.030**	**0.151**	0.026	0.004	0.210	**0.181**

Note: Number of offenses registered per capita and year, average of 2004 and 2006.
Source: Zurich Statistics Office, Zurich City Police Department.

Table 9: Victimization Rates in Zurich, by Crime Type

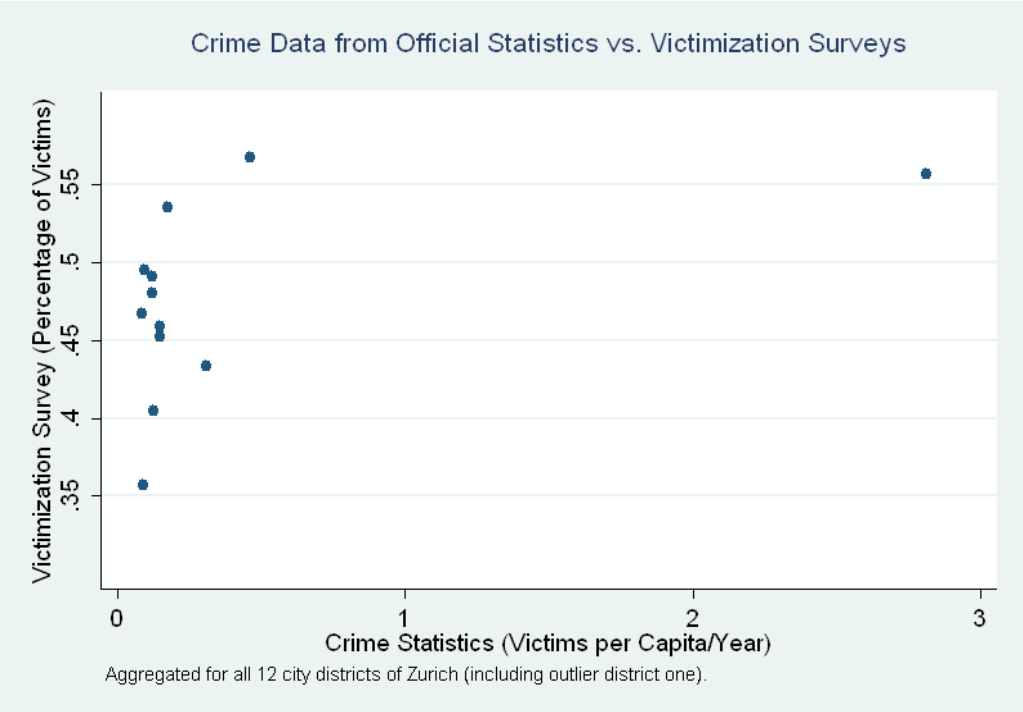
District	Victim of Violent Crime		Victim of Property Crime		Vic. Property or Violence	
	mean	*std. dev.*	*mean*	*std. dev.*	*mean*	*std. dev.*
1	21.1%	0.409	43.9%	0.498	55.3%	0.499
2	11.8%	0.323	35.4%	0.479	45.0%	0.498
3	15.5%	0.362	37.5%	0.484	48.8%	0.500
4	16.6%	0.372	29.1%	0.455	43.2%	0.496
5	20.1%	0.402	44.6%	0.498	56.3%	0.497
6	12.2%	0.327	39.9%	0.490	47.8%	0.500
7	11.9%	0.324	40.2%	0.491	49.6%	0.500
8	12.9%	0.336	45.1%	0.498	53.6%	0.500
9	12.1%	0.326	30.7%	0.461	40.5%	0.491
10	12.3%	0.328	37.4%	0.484	46.5%	0.499
11	13.4%	0.341	35.7%	0.479	45.7%	0.498
12	12.0%	0.325	25.9%	0.438	35.7%	0.480
Total	**13.4%**	0.341	**35.8%**	0.480	**45.9%**	0.498

Source: Own calculations based on Zurich Crime Survey.

Notwithstanding the differences in measurement units between the official and the survey data, at first glance, the crime pattern reflected in the statistical information – e.g., district 1 and, to a lesser extent, district 5 as high-crime areas – are only loosely correlated with the survey data. However, correlation coefficients are 0.296*** for violent crime, 0.077*** for property crime, and 0.136*** for both crime types aggregated.

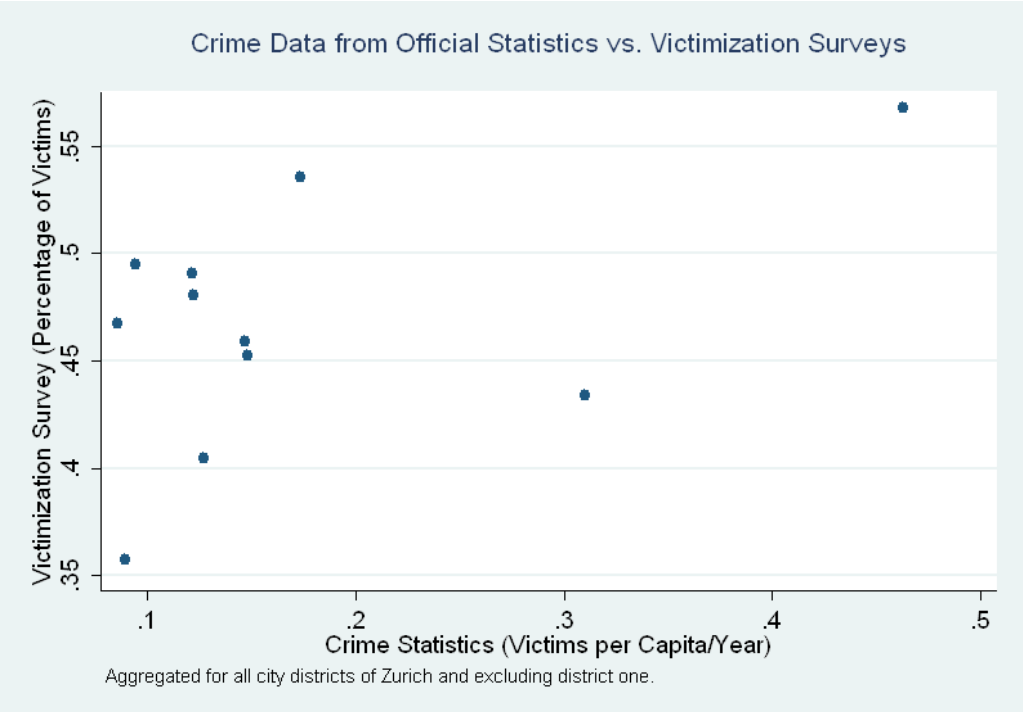
Notable is the relatively high correlation with regards to violent crime. Aggregated crime and victimization data (violence and property crimes) for the twelve city districts are graphically plotted in Figures 6 and 7, the latter of which excludes the outlier district one. Correlations for the data from crime statistics and victimization survey are presented separately for violent vs. property crimes in Figures A.8 and A.9 in the Appendix.

Figure 6: Total Crime, Police Crime Records and Victimization Surveys (Incl. District 1)



Sources: Zurich Statistics Office, Zurich City Police Department, Zurich Crime Survey.

Figure 7: Total Crime, Police Crime Records and Victimization Surveys (Excl. District 1)



Sources: Zurich Statistics Office, Zurich City Police Department, Zurich Crime Survey.

One observation illustrates a common discrepancy between official (police) crime data and victimization surveys: In district 1, the central business and banking area of Zurich with some of Switzerland's highest priced real estate, the numbers of property (and also violent) crime statistically registered is high relative to other districts.

This discrepancy seems to (almost) disappear in victimization surveys. The latter typically focus on individuals actually *living* in the respective district and do not consider, e.g., commuters or local businesses. Section 2.7.2 explores this methodical aspect with regards to spatial delimitation in more detail.

2.6.2 Hypothesis 1: Fear of Crime and Victimization Risk

From a rational choice perspective, one would expect people to be more fearful of crime the higher their risk of victimization. The analysis now turns to two different ways in which fear and risk variables can be regionally aggregated in the available data set, i.e. by city district (twelve in total) or by city neighborhood (34 in total).

Fear of violent crime correlates positively with the risk of violent victimization on the level of districts (r=.379***) as well as on the level of neighborhoods (r=.332***). In stark contrast, fear of property crime seems to be negatively related to the risk of property victimization when looking at regionally aggregated data (r=-.646*** on the district level; r=-.450*** on the neighborhood level).

The categorization of fear of crime and victimization risks is further differentiated regarding specific socio-economic groups, i.e. for men versus women in (three or five) different age groups. When using these more differentiated aggregates, two results are noteworthy: First, with regards to violent crime, the positive correlation between fear and risk becomes somewhat smaller but basically persists.[78]

Second, with regards to property crime, the negative correlation between fear and risk disappears or even becomes positive when looking at these socio-demographically diversified groups.[79] Thus, there is an initial indication of some paradoxical discrepancy between fear and risk of becoming a victim of property crime when only looking at geographical units. However, the correlation is driven by district-specific gender- and age-differences.

Hypothesis 1 is further tested using multiple regression models with individual fear of crime as dependent and (group) victimization risk as well as individual characteristics as independent variables. Table 10 displays the regression results. Column (I) contains the coefficients resulting from the regression of 'Fear of Violent Crime'. To get some information on the robustness of the central coefficient, column (II) additionally includes the victimization risk with regards to property crime. Columns (III) and (IV) present the analogous results for property crime.[80]

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[78] Differentiating between gender, five age categories (each containing approximately 20 per cent of the sample), and the twelve districts (120 groups in total) results in r=.356***. When considering gender, all 34 neighborhoods separately and, in return, only three age categories (each containing approximately a third of all observations), 204 group aggregates are calculated and the corresponding r is .291***.

[79] Differentiating between gender, five age categories, and districts: r=.171***. Differentiating between neighborhoods, gender, and three age categories: r=.026*.

[80] In correspondence to the independent variables included in the respective models, standard errors are adjusted for clustering for districts, neighborhoods, or district/neighborhood-year-groups. On clustering with a small number of groups, see Wooldridge (2003).

Table 10: Fear of Crime and Victimization Risks

	Fear of Violent Crime		Fear of Property Crime	
	(I)	**(II)**	**(III)**	**(IV)**
Vict. Risk Violence	0.315	0.322		-0.016
	1.77	1.84		-0.08
Vict. Risk Property		-0.390**	-0.117	-0.117
		-2.61	-0.89	-0.89
Male	-0.635***	-0.613***	-0.215***	-0.211*
	-6.21	-5.85	-3.28	-1.98
Age	0.003	0.008*	0.014***	0.0144***
	0.95	2.48	4.64	4.11
(Age^2)/100	-0.013***	-0.018***	-0.0173***	-0.017***
	-5.39	-5.58	-6.22	-5.13
Age x Male	0.011*	0.010*	0.007**	0.007
	2.50	2.44	2.83	1.87
(Age^2)/100 x Male	-0.005	-0.006	-0.008**	-0.008*
	-1.30	-1.50	-3.20	-2.47
High Income	-0.014	-0.012	0.016	0.016
	-0.77	-0.62	0.78	0.78
Individual Characteristics		Included		
Constant	2.038***	2.024***	1.700***	1.702***
	25.21	26.17	20.51	22.15
N	6979	6979	6979	6979
R squared	0.1015	0.1036	0.0401	0.0401

Notes: Individual Characteristics include: Education, Occupation, Foreigner, Lives in Appartment, Single Person Household, Survey Wave.
Partial correlates from OLS regressions; coefficients above t-statistics.
Significance levels: *.05<p<.01, **.001<p<.01, ***p<.001.
Source: Own calculations based on Zurich Crime Survey.

In accordance to Hypothesis 1, for fear of violent crime, there is a (marginally statistically significant) positive partial correlation between risk and fear. This does not hold for fear of property offences: Controlling for socio-demographics, there seems to be a negative relationship (though not statistically significant) between fear of property crimes and the corresponding victimization risk. The models do not explain a large fraction of the variation in fear of crime: The R-squared is particularly small in the property crime models (III) and (IV). The inclusion of the victimization risk with regards to the crime type not referred to on the left-hand side of the equation (estimations II and IV) does not alter the findings.

2.6.3 Hypothesis 2: Fear of Crime and Vulnerability

According the Vulnerability Thesis (as reflected in Hypothesis 2), certain socio-demographic groups are more vulnerable to certain crime types and, therefore, are thus more fearful. It is commonly argued that, e.g., women are more fearful of violent crime than men; elderly people feel physically weaker and thus more vulnerable than adolescents; wealthy people are more fearful of property offences (though, from an equilibrium perspective, they can also afford more measures to protect themselves); and so fourth. This section adds to previous (mainly criminological) research by studying socio-demographic correlates of the fear of crime.

The empirical analysis is two-stepped: First, the correlates of individual victimization are summarized. Second, the socio-economic correlates of fear of crime are analyzed. Table A.1 in the Appendix shows the partial correlates of individual victimization (binary coded) with regards to property crime (estimations I and II) and violent crime (estimations III and IV), respectively.[81] As becomes evident from Table A.1, individually reported victimization differs regarding to the respondent's age (for both types of crime) and gender (for violent crimes). This observation corresponds with the assumption underlying Hypothesis 2 that individual victimization depends on individual attributes reflecting vulnerability.

Individual characteristics are systematically correlated with subjective fear of crime. The linear relation between subjective fear and key socio-demographic variables shows that fear of violent crime, is (significantly) negatively correlated with 'age' (correlation coefficient, r=-.222***) and 'being a male' (r=-.171***).

'High education' (r=-.021*, with a significance level of .081) is almost and 'high income' (r= -.003, sig. level=.774) is not significantly correlated with fear of property crime. With regards to violent crime, similar patterns are observed: 'Age' (r=-.088***) and 'being a male' (r=-.067***) are positively, 'high education' (r=-.018, sig. level=.122) and 'high income' (r=-.010, sig. level=.394) are not correlated with fear of violent crime.

Table 10 includes the partial correlates for multiple socio-economic attributes and fear of crime.[82] Controlling for the other variables included in the regressions, men seem to express significantly less fear. This holds especially for the fear of violent crime, where the (highly significant) gender difference amounts to -.635*** points (column I), but it is also the case when looking at fear of property crime with a coefficient of -0.215*** (column III).

This finding contrasts with the result that men are more often than (as often as) women becoming a victim of violent (property) crime. However, it does support the popular vulnerability thesis (Hypothesis 2) assuming that men feel less vulnerable. It remains unsettled whether asymmetries in fear reporting behavior between men and women or cognitive imperfections (incomplete information about crime occurrence or inadequate information processing) underlie this observation.

No significant partial correlations can be found between income and fear of crime. This does not imply that income is irrelevant for the fear of crime. On the one hand, more financial means may render an individual a more attractive target of crime, but at the same time, the individual also can devote more resources to preventative measures and self-protection. If these two potential channels through which income might influence fear counterbalance each other, a result similar to the one observed is likely.

Another socio-demographic characteristic indicating an aspect of vulnerability is a person's age. Under the model assumption of a quadratic relation between age and fear, the data suggest an invertedly u-shaped fear-curve, i.e. the coefficient of the quadratic age term is negative and significant for both crime types.

The relationship between fear of crime and age is graphed in Figures 8 and 9 for violent and property crime, respectively. These curves are generated for the reference group (Table 10). For both

[81] While columns (I) and (III) include age as continuous variable, columns (II) and (IV) include it as a categorical variable.

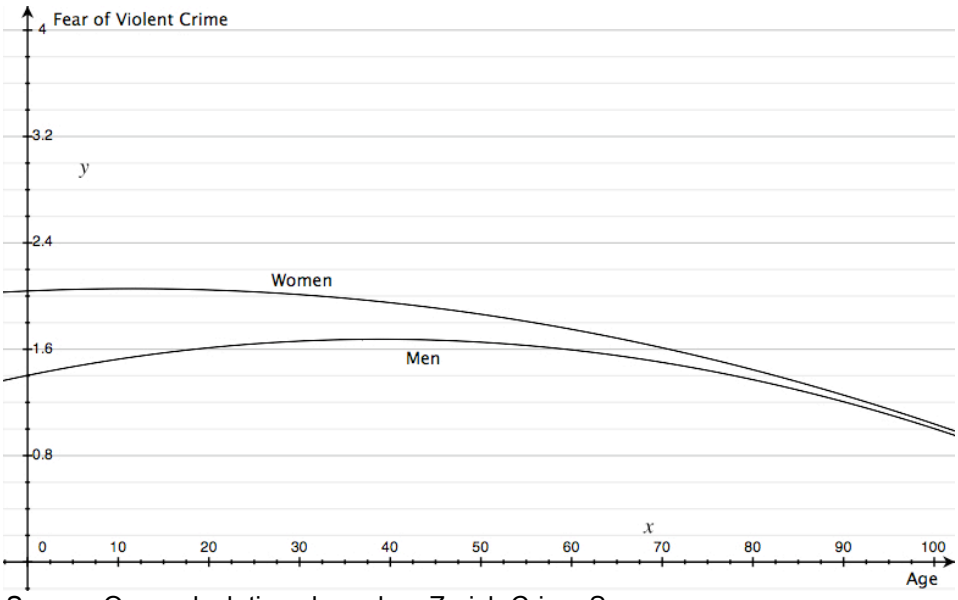
[82] Fear of crime is defined as an average value between 1 and 4, see section 2.5.2.

genders, the maximum in the fear-age-curve lies at a lower age for violent than property crime. Fear of Violence is highest at the age of 38.9 years for men and at an out-of-sample age of 11.5 years for women, i.e. fear of violent crime is decreasing in age for female individuals covered by the survey. Fear of property crime reaches its maximum values at 42.0 years for men and at 41.2 years for women.

In sum, the following age patterns can be observed in the data. First, compared to the fear of property crime, fear of violent crime seems to be more virulent for younger people. This finding corresponds with common sense, as teenagers and young adults do generally not have a lot of assets, they are unattractive property crime targets. However, as they go out at night more frequently, they are exposed to potentially violent situations relatively often.

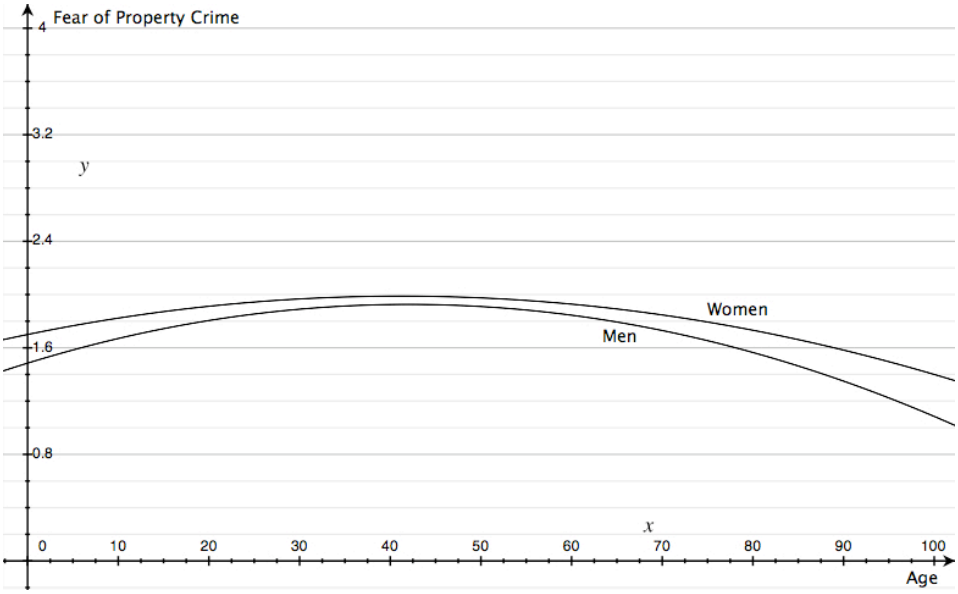
Second, the estimated age-fear-curves are gender-specific. While men generally express lower levels of fear than women, the differences in expressed fear levels and curvature are less pronounced with regard to property crime compared to the fear of violent crime.

Figure 8: The Relationship between Fear of Violent Crime and Age



Source: Own calculations based on Zurich Crime Survey.

Figure 9: The Relationship between Fear of Property Crime and Age



Source: Own calculations based on Zurich Crime Survey.

While there are gender differences in fear of crime, there might also be gender-specific correlations between fear of crime and victimization as well as socio-economic characteristics. The same models as in Table 10 (columns I and III) are estimated separately for women and men. Table 11 shows the results.

Table 11: Fear of Crime – Gender-Specific Estimations

	Fear of Violent Crime		**Fear of Property Crime**	
	Women (I)	**Men (II)**	**Women (III)**	**Men (IV)**
Vict. Risk Violence	0.398*	0.225		
	2.28	0.92		
Vict. Risk Property			-0.244	-0.018
			-1.30	-0.10
Age	0.002	0.013***	0.017***	0.019***
	0.87	5.31	4.27	4.96
(Age^2)/100	-0.013***	-0.018***	-0.020***	-0.023***
	-5.65	-10.35	-5.75	-5.79
High Income	-0.031	0.001	-0.002	0.032
	-1.13	0.08	-0.11	1.31
High Education	-0.096***	-0.019	-0.076***	-0.008
	-5.28	-0.72	-4.02	-0.39
Individual Characteristics	Included			
Constant	2.049***	1.413***	1.682***	1.485***
	28.19	11.29	15.61	18.96
N	3607	3372	3607	3372
R squared	0.1008	0.0504	0.0496	0.0345

Notes: Individual Characteristics include: Occupation, Foreigner, Lives in Appartment, Single Person Household, Survey Wave.
Partial correlates from OLS regressions; coefficients above t-statistics.
Significance levels: *.05<p<.01, **.001<p<.01, ***p<.001.
Source: Own calculations based on Zurich Crime Survey.

While no significant relation between risk and fear of violent crime was found in the whole sample, differences between men and women appear when estimating separately for both genders: For women, risk is positively and significantly correlated with fear, whereas this relation is not significant at any conventional levels for men. Income does not appear to be related to fear of violent crime for both genders. A relatively high education level clearly reduces women's (but not men's) fear. Additionally, being a foreign national seems to be a relevant fear-increasing factor for women, but it is not significantly related to men's fear.

With regard to the fear of *property* crime, the coefficient for victimization risk is clearly bigger in size for women (compared to the aggregated estimations and those for men), but it is still insignificantly correlated with fear. For men, there is again no clear relation between risk and fear. Income does not seem to be related to fear of crime for either sex, whereas a high education and Swiss national identity appear to lower women's (but not men's) fear of crime.

2.6.4 Hypotheses 3 and 4: Fear of Crime and Neighborhood Disorder

The presence of disorder is another factor possibly responsible for the observed weak relationship between risk and fear besides the vulnerability considerations. Visible signs of neighborhood disorder and incivilities might signal incapability of public authorities to cope with social problems, act as cues for a loss of control, and indicate a low level of public security in that area. Therefore, these signs of disorder are expected to facilitate fear of crime.

Aggregate perceptions of disorder are taken into account when explaining fear of crime in a multiple regression framework. Table 12 shows the corresponding results for the fear of violent (estimations I, II, and III) and property crime (estimations IV, V, and VI), respectively. Underlying is an aggregation of disorder perceptions by city neighborhood (and survey wave). Estimations (II) and (V) include year fixed effects, and estimations (III) and (VI) also include neighborhood fixed effects.

Table 12: Fear of Crime and Neighborhood Disorder

	Fear of Violent Crime			Fear of Property Crime		
	(I)	**(II)**	**(III)**	**(IV)**	**(V)**	**(VI)**
Vict. Risk Violence	0.074	0.046	0.050			
	0.61	0.39	0.40			
Vict. Risk Property				-0.071	-0.048	0.009
				-0.96	-0.75	0.09
Aggregate Perceptions:						
Graffiti	-0.182	-0.121	0.128	-0.053	-0.060	0.014
	-1.90	-1.30	1.20	-0.65	-0.66	0.12
Littering	0.109	0.194	0.110	-0.076	0.089	0.016
	0.84	1.29	0.52	-0.90	0.95	0.07
Dubious People	0.414**	0.461***	0.441*	0.334**	0.334**	0.377*
	2.85	3.48	2.46	2.58	3.12	2.13
Run-Down Houses	0.067	-0.069	-0.114	-0.029	-0.059	-0.266
	0.32	-0.30	-0.36	-0.21	-0.38	-0.89
Nightclubs	-0.017	-0.084	-0.131	-0.053	-0.104	-0.114
	-0.16	-0.80	-0.60	-0.60	-1.27	-0.53
Year Fixed Effects		Included	Included		Included	Included
Neighborh. Fixed Effects			Included			Included
Individual Characteristics	Included	Included	Included	Included	Included	Included
Constant	1.963***	1.932***	1.893***	1.613***	1.633***	1.631***
	19.38	18.95	15.78	19.15	17.52	13.86
N	6979	6979	6979	6979	6979	6979
R squared	0.1068	0.1087	0.1152	0.0393	0.0433	0.0481

Notes: Victimization risk is aggregated by neighborhood, gender and three age categories; disorde perceptions are aggregated by neighborhood and year.
Individual Characteristics include: Age, Male, Age x Male, (Age^2)/100 x Male, Age Cat. x Male, Education, Income, Occupation, Foreigner, Lives in Appartment, Single Person Household.
Partial correlates from OLS regressions; coefficients above t-statistics.
Significance levels: *.05<p<.01, **.001<p<.01, ***p<.001.
Source: Own calculations based on Zurich Crime Survey.

Keeping the victimization risk constant, no significant partial correlation between the average presence of any type of disorder and fear can be observed, except for the presence of dubious people. A higher presence of dubious people in one's neighborhood is associated with higher fear of crime. This holds if neighborhood (and year) fixed effects are included[83] in the estimation models, and the coefficients are somewhat larger for the fear of violent than property crime. While it would be difficult to explain why the presence of graffiti and nightclubs is negatively correlated with fear, these coefficients are not statistically significant at any conventional level – especially when fixed effects are accounted for.

Thus, 'social' disorder – of which the dubious people loitering around are the most prominently described form – seems to be more relevant for the fear of crime than 'physical' disorder (such as graffiti and littering). Another interesting finding is that the relation between victimization risk and fear is now entirely statistically insignificant for both violent and property crime. Thus, Hypothesis 3 finds partial support in the Zurich Crime Survey data – with regards to dubious people – though, the other signs of neighborhood disorder do not seem to correlate with fear of crime.

[83] This is done because the aggregated disorder measures might also reflect other factors than disorder, which influence both the choice of residence area and fear (neighborhood effects vs. neighborhood *disorder* effects).

According to the established version of the incivilities thesis, neighborhood disorder and incivilities are not only related with higher levels of fear, but these environmental conditions do also directly reflect and are conducive to a higher level of victimization risk.

Table 13: Victimization Risk and Neighborhood Disorder

	Vict. Risk Violent Crime			**Vict. Risk of Property Crime**		
	(I)	**(II)**	**(III)**	**(IV)**	**(V)**	**(VI)**
Male	0.207***	0.208***	0.210***	-0.008	-0.010	-0.017
	4.95	4.99	5.04	-0.19	-0.23	-0.39
Age	0.001	0.001	0.001	0.008***	0.008***	0.008***
	1.05	1.07	1.07	6.97	7.04	6.77
Aggregate Perceptions:						
Graffiti	0.035	0.041	-0.021	0.217**	0.214**	-0.001
	1.12	1.34	-1.50	3.23	3.10	-0.07
Littering	0.039	0.051	0.023	-0.039	-0.061	0.013
	1.47	1.87	1.33	-0.43	-0.59	0.35
Dubious People	0.021	0.027	-0.033	-0.044	-0.047	-0.023
	0.55	0.66	-1.48	-0.33	-0.34	-0.67
Run-Down Houses	-0.095	-0.110	0.051	0.024	0.034	0.026
	-1.72	-1.88	1.31	0.18	0.24	0.64
Nightclubs	0.064*	0.056	0.005	-0.041	-0.031	-0.025
	2.12	1.83	0.25	-0.49	-0.36	-0.54
Year Fixed Effects		Included	Included		Included	Included
Neighborh. Fixed Effects			Included			Included
Individual Characteristics	Included	Included	Included	Included	Included	Included
Constant	0.102**	0.099**	0.116***	0.079	0.078	0.089**
	3.01	2.95	3.60	1.69	1.69	2.61
N	6979	6979	6979	6979	6979	6979
R squared	0.3884	0.3904	0.4618	0.2516	0.2539	0.5109

Notes: Victimization risk is aggregated by neighborhood, gender and three age categories; disorde perceptions are aggregated by neighborhood and year.
Individual Characteristics include: Age x Male, (Age^2)/100 x Male, Age Cat. x Male, Education, Occupation, Income, Foreigner, Lives in Appartment, Single Person Household.
Partial correlates from OLS regressions; coefficients above t-statistics.
Significance levels: *.05<p<.01, **.001<p<.01, ***p<.001.
Source: Own calculations based on Zurich Crime Survey.

Table 13 shows the regression output of a model with victimization risk (aggregated by neighborhood, gender, and three age groups) on the left-hand side and averaged disorder presence (besides individual characteristics) as explanatory variables. As long as year- and neighborhood-fixed effects are not included, a significant positive relation (a) between the presence of nightclubs and the risk of violent victimization and (b) between graffiti and the property crime victimization risk is visible in the data.

All disorder coefficients become insignificant, as soon as year- and neighborhood-fixed effects are accounted for, suggesting that the before mentioned relationships might be some kind of neighborhood effects not necessarily directly related to actual disorder. Thus, there is not enough

variation over time in order to separate potentially correlated neighborhood-specific effects from aggregate, year-neighborhood specific disorder visibility. Interestingly, the perception of dubious people is not statistically related with a higher victimization risk.

According to the existing literature, not just the average presence of incivilities, but also the subjectively perceived presence of signs for disorder in the neighborhood relates with fear of the crime. Previous research on the incivility thesis has often relied solely on individual disorder perceptions and intended to explain subjective fear of crime with these subjective perceptions.

This might be an inaccurate approach to analyze the empirical relation between (actual) disorder and fear: It can be argued that the same factors driving subjective feelings of fear are also related to the subjective perception of neighborhood disorder and incivilities. If this applies, the partial correlations are biased and render a testing of the hypotheses about disorder and fear of crime difficult. This issue often appears in empirical research attempting to explain subjective valuations with other subjective valuations referring to a similar area of life and society.

In order to perform a statistical check on whether the correlation between disorder and fear – which, in fact, is only significant for 'dubious people' – is a robust observation or spurious and attributable to individually perceived disorder. The question underlying Hypothesis 4 is whether and in how far fear of crime and the subjective visibility of disorder reflect similar personal traits. Table 14 displays equivalent regression results as in Table 12, but contains subjective perceptions of disorder signals in addition to the aggregate, neighborhood-level measures.

Including subjective (or individual) perceptions of disorder renders the previously significant partial correlation between the average presence of 'dubious people' and fear insignificant, especially if year and neighborhood fixed effects are also included. Thus, some part of the coefficient of the aggregated measure (visibility of 'dubious people) might be attributable to subjective valuations.

Furthermore, all coefficients of subjectively perceived signals show clearly higher t-values, i.e. they are statistically more significantly correlated with fear, than aggregate measures of visibility. Except for the presence of 'nightclubs', all subjectively perceived types of disorder correlate positively with fear of crime. To some degree, this might reflect unobserved third variables.

Again, as was the case when only including averaged measures of disorder, the (subjective) perception 'dubious people' has by far the largest and most significant coefficient. When comparing the two types of crime, subjective perceptions of graffiti seem to be stronger related to the fear of property crime, whereas subjective perceptions of run-down houses correlates stronger with fear of violent crime.

Table 14: Fear of Crime, Average Neighborhood Disorder and the Perception of Disorder

	Fear of Violent Crime			Fear of Property Crime		
	(I)	(II)	(III)	(IV)	(V)	(VI)
Vict. Risk Violence	0.091	0.064	0.070			
	0.76	0.54	0.56			
Vict. Risk Property				-0.068	-0.046	0.008
				-0.89	-0.69	0.08
Aggregate Perceptions:						
Graffiti	-0.219*	-0.159	0.089	-0.129	-0.135	-0.065
	-2.34	-1.73	0.85	-1.63	-1.54	-0.57
Littering	0.022	0.102	0.041	-0.170	-0.010	-0.060
	0.16	0.64	0.19	-2.06	-0.10	-0.26
Dubious People	0.228	0.276	0.260	0.168	0.170	0.214
	1.57	2.09	1.45	1.36	1.62	1.20
Run-Down Houses	-0.008	-0.142	-0.178	-0.082	-0.111	-0.301
	-0.03	-0.60	-0.54	-0.58	-0.69	-0.98
Nightclubs	0.005	-0.061	-0.109	-0.066	-0.117	-0.130
	0.04	-0.55	-0.50	-0.79	-1.46	-0.59
Subjective Perceptions:						
Graffiti	0.044*	0.044*	0.045*	0.083***	0.082***	0.082***
	2.50	2.51	2.55	5.45	5.41	5.41
Littering	0.071***	0.071***	0.070***	0.080***	0.081***	0.080***
	4.15	4.12	4.08	4.38	4.38	4.33
Dubious People	0.200***	0.200***	0.200***	0.178***	0.178***	0.178***
	11.13	11.14	11.16	10.44	10.36	10.34
Run-Down Houses	0.071**	0.071**	0.072**	0.048*	0.047	0.046
	2.71	2.72	2.74	2.00	1.94	1.90
Nightclubs	-0.030	-0.030	-0.033	0.007	0.008	0.006
	-1.10	-1.09	-1.18	0.30	0.32	0.27
Year Fixed Effects		Included	Included		Included	Included
Neighborh. Fixed Effects			Included			Included
Individual Characteristics	Included	Included	Included	Included	Included	Included
Constant	2.014***	1.983***	1.936***	1.667***	1.686***	1.678***
	20.11	19.57	16.60	21.24	19.36	14.79
N	6979	6979	6979	6979	6979	6979
R squared	0.1346	0.1364	0.1430	0.0749	0.0787	0.0834

Notes: Victimization risk is aggregated by neighborhood, gender and three age categories; disorder perceptions are aggregated by neighborhood and year.
Individual Characteristics include: Age, Male, Age x Male, (Age^2)/100 x Male, Age Cat. x Male, Education, Occupation, Income, Foreigner, Lives in Appartment, Single Person Household.
Partial correlates from OLS regressions; coefficients above t-statistics.
Significance levels: *.05<p<.01, **.001<p<.01, ***p<.001.
Source: Own calculations based on Zurich Crime Survey.

2.6.5 Hypotheses 5 and 6: Fear of Crime and Neighborhood Police Presence

Higher police presence is expected to correspond with lower levels of the residents' fear of crime.[84] Corresponding to the previous section 2.6.4, models with fear of crime as dependent variable, and neighborhood-average police presence as well as all equivalently aggregated signals of disorder and

[84] Although the opposite relation is also possible, i.e. a higher presence of police patrols could signal a higher risk of victimization and increase residents' fear of crime, the assumption expressed in Hypothesis 5 is more common in the literature on policing and fear of crime (see section 2.4.2)

individual characteristics as explanatory variables are analyzed. Police presence is coded as a binary variable equaling unity if a respondent has seen a police patrol today or this week in his or her neighborhood (zero otherwise). These statements are aggregated by neighborhood and survey year in order to obtain average measures of police visibility. Table 15 shows the resulting partial correlations between aggregate police presence and fear of crime.

Table 15: Fear of Crime and Neighborhood Police Presence

	Fear of Violent Crime			**Fear of Property Crime**		
	(I)	**(II)**	**(III)**	**(IV)**	**(V)**	**(VI)**
Vict. Risk Violence	0.075	0.050	0.054			
	0.61	0.41	0.44			
Vict. Risk Property				-0.056	-0.063	0.009
				-0.83	-0.94	0.10
Aggregate Perceptions:						
Police Presence	-0.045	-0.234*	-0.228	0.116**	-0.308**	-0.227
	-1.15	-2.10	-1.60	2.80	-2.64	-1.28
Year Fixed Effects		Included	Included		Included	Included
Neighborh. Fixed Effects			Included			Included
Individual Characteristics	Included	Included	Included	Included	Included	Included
Constant	1.982***	2.086***	2.076***	1.562***	1.838***	1.814***
	19.92	16.78	13.12	17.65	15.61	10.96
N	6979	6979	6979	6979	6979	6979
R squared	0.1070	0.1093	0.1155	0.0408	0.0446	0.0485

Notes: Victimization risk is aggregated by neighborhood, gender and three age categories; disorder perceptions are aggregated by neighborhood and year.
Individual Characteristics include: Age, Male, Age x Male, (Age^2)/100 x Male, Age Cat. x Male, Education, Occupation, Income, Foreigner, Lives in Appartment, Single Person Household.
Partial correlates from OLS regressions; coefficients above t-statistics.
Significance levels: *.05<p<.01, **.001<p<.01, ***p<.001.
Source: Own calculations based on Zurich Crime Survey.

Average police presence in a neighborhood does not seem to have a clear and robust effect across the three model specifications (per crime type) represented in Table 15.[85] While it appears to lower the fear of violent crime, this effect is not statistically significant if either no or both types of fixed effects (controlling for time and location) are included. At least, police presence does not seem to 'backfire' in the sense of increasing residents' fear of violent crime.

With regards to property crime, the coefficient of aggregate police visibility is not robust, neither, and becomes insignificant when year and neighborhood fixed effects are included. Consequently, according to the Zurich Crime Survey data, there is not much evidence supporting Hypothesis 5, which states that police presence is expected to reduce people's fear of crime.

[85] Aggregate disorder reduction might be a channel through which police presence works (e.g., if visible police patrols reduce the presence of 'dubious people'). However, when aggregate disorder is excluded, the results are qualitatively identical and the size of the coefficients is similar to those displayed in Table 15.

As argued in the analysis of public disorder, police presence may be more strongly correlated on the level of subjective perceptions than as an aggregate measure. This argumentation is reflected in Hypothesis 6. The particular results are represented in Table 16 for the fear of violent (columns I-III) and property (columns IV-VI) crime. All estimations control for aggregate neighborhood disorder, but the results are analogue if disorder is excluded from the estimation models.

Table 16: Fear of Crime, Subjective and Aggregate Neighborhood Police Presence

	Fear of Violent Crime			**Fear of Property Crime**		
	(I)	**(II)**	**(III)**	**(IV)**	**(V)**	**(VI)**
Vict. Risk Violence	0.073	0.048	0.052			
	0.61	0.40	0.42			
Vict. Risk Property				-0.057	-0.063	0.009
				-0.83	-0.95	0.09
Aggregate Perceptions:						
Police Presence	-0.012	-0.201	-0.196	0.125**	-0.299*	-0.218
	-0.26	-1.89	-1.35	2.71	-2.54	-1.22
Subjective Perceptions:						
Police Visibility	-0.034	-0.034	-0.033	-0.010	-0.010	-0.010
	-1.63	-1.61	-1.60	-0.45	-0.43	-0.43
Year Fixed Effects		Included	Included		Included	Included
Neighborh. Fixed Effects			Included			Included
Individual Characteristics	Included	Included	Included	Included	Included	Included
Constant	1.978***	2.082***	2.074***	1.561***	1.837***	1.813***
	19.88	16.84	13.03	17.69	15.65	10.94
N	6979	6979	6979	6979	6979	6979
R squared	0.1076	0.1098	0.1160	0.0409	0.0446	0.0485

Notes: Victimization risk is aggregated by neighborhood, gender and three age categories; disorder perceptions are aggregated by neighborhood and year.
Individual Characteristics include: Age, Male, Age x Male, (Age^2)/100 x Male, Age Cat. x Male, Education, Occupation, Income, Foreigner, Lives in Appartment, Single Person Household.
Partial correlates from OLS regressions; coefficients above t-statistics.
Significance levels: *.05<p<.01, **.001<p<.01, ***p<.001.
Source: Own calculations based on Zurich Crime Survey.

Similar to the estimation without subjective police perceptions, average police presence does not exhibit a robust correlation with fear of crime. Particularly, when neighborhood effects are separately controlled, the coefficient of aggregate police visibility is negatively, though insignificantly correlated with fear of crime. However, it can be argued in favor of estimations (II) and (V), where there is sufficient (spatial) variation in the aggregate police perception measure.

Subjective police perceptions are not strongly associated with fear of crime. Thus, controlling for victimization risk, aggregate police presence, and other individual characteristics, subjective fear of crime does not show a statistically significant partial correlation with individual perceptions of police patrols. With reference to Hypothesis 6, there is no evidence in the data that individual, and only faint evidence that aggregate measures of police perception correlate with fear of crime.

2.6.6 *Hypothesis 7: Fear of Crime and Individually Experienced Victimization*

Hypothesis 7 argues that individuals with previous victimization experiences are more fearful of crime (and assess future victimization likelihood differently) than people without personal victimization experiences. This relation might not only hold for the crime type a person suffered from, but for both types of crime.

Table 17 presents the results of four model specifications for each type of crime (columns I-IV refer to the fear of violent crime, V-VIII to the fear of property crime). Besides individual characteristics and survey wave controls, columns (I) and (V) only consider individual victimization experience of the crime type corresponding to the one reflected in the dependent variable.

Estimations (II) and (VI) add aggregated victimization risk (aggregated by district and five age groups) to the right-hand side of the equations. The next columns (III) and (VII) also account for victimization experience and risk regarding the crime category not reflected in the dependent fear variable. Finally, as robustness check of the preciously obtained coefficients, models (IV) and (VIII) also control for average disorder and police presence in the respondents' neighborhood.

Table 17: Fear of Crime and Previously Experienced Victimization

	Fear of Violent Crime				**Fear of Property Crime**			
	(I)	**(II)**	**(III)**	**(IV)**	**(V)**	**(VI)**	**(VII)**	**(VIII)**
Individual Experience:								
Victimization Violence	0.220***	0.217***	0.222***	0.220***			0.064**	0.063**
	12.98	12.85	13.29	13.07			2.70	2.62
Victimization Property			0.032	0.030	0.118***	0.122***	0.126***	0.124***
			1.70	1.61	7.59	8.96	9.40	9.48
Aggregate Measures:								
Vict. Risk Violence		0.116	0.118	-0.029			-0.077	-0.131
		0.66	0.69	-0.19			-0.36	-0.59
Vict. Risk Property			-0.411**	-0.318***		-0.204	-0.206	-0.146
			-2.91	-3.37		-1.61	-1.64	-1.39
Aggregate Disorder				Included				Included
Aggregate Police Pres.				Included				Included
Individual Characteristics		Included				Included		
Constant	2.053***	2.043***	2.030***	2.051***	1.712***	1.705***	1.709***	1.820***
	24.95	25.08	26.13	18.95	20.98	20.35	21.68	18.37
N	6979	6979	6979	6979	6979	6979	6979	6979
R squared	0.1133	0.1134	0.1159	0.1232	0.0484	0.0490	0.0503	0.0545

Notes: Victimization risk is aggregated by neighborhood, gender and three age categories; disorder perceptions are aggregated by neighborhood and year.
Individual Characteristics include: Age, Male, Age x Male, (Age^2)/100 x Male, Age Cat. x Male, Education, Occupation, Foreigner, Lives in Appartment, Single Person Household, Survey Wave.
Partial correlates from OLS regressions; coefficients above t-statistics.
Significance levels: *.05<p<.01, **.001<p<.01, ***p<.001.
Source: Own calculations based on Zurich Crime Survey.

When looking at estimations (I) and (IV), there are clearly positive partial correlations between victimization experiences and fear of crime with regards to the corresponding crime type. This result is robustly holds across all model specifications controlling for aggregated victimization risk, disorder and

police presence (first row in columns I-IV, second row in columns V-VIII). The fear of property crime is also relatively higher for people who have been violently victimized, but the fear of violent crime seems to be unaffected by (i.e., not significantly correlated with) property crime victimization experiences.

As observed before in Table 10 (section 2.6.2), violent victimization risks still appears to be not significantly related to the fear of violence, although these coefficients are clearly smaller and less significant when individual victimization experience is accounted for. Again, the risk of becoming a victim of property crime is slightly negatively related to the fear of property crime. The observed negative correlation between the risk of property victimization and the fear of violent crime is somewhat harder to explain (columns III and IV).

As coefficients and significant levels of individual victimization experiences remain virtually unaltered across different model specifications, Hypothesis 7 (suggesting a positive partial correlation between victimization experiences and fear) cannot be rejected. This result holds also when victimization risks, average signals of disorder, and police visibility in a resident's neighborhood are controlled for. Additionally, the partial correlation between individual crime experiences and fear of the corresponding crime type is stronger (i.e. the coefficients are larger) for violent than for property crime.

2.7 Open Issues for Future Research

2.7.1 Measurement

Research on the fear of crime has become a prominently discussed policy issue. However, theoretical under-specification and technical issues of survey item wording might have fundamentally distorted our knowledge about the topic (Jackson 2005). Since the very beginning of this research, the validity and reliability of fear of crime measures have continuously been questioned (e.g. Skogan 1981, Zauberman 1985, Bernard 1992, Bowling 1992, Fattah 1993, Farrall et al. 1997). Nevertheless, Farrall et al. (1997) are one of a few exceptions empirically investigating different fear of crime measures.

Jackson (2005) discusses the advantages of defining, measuring and analyzing social phenomena such as the fear of crime "in a broad and inclusive manner" (p. 298). One possible way for the future research agenda is to include additional measures, e.g. observatory measures (physiological etc.), besides the reported survey-measures.

Yet even survey measures focusing on fear of specific crimes and the intensity of this fear mask considerable complexity about potential affective and cognitive processes involved on the respondents' side (Girling et al. 2003, Jackson 2005). As emotions are often transitory, asking for an intensity of felt emotion demands rather difficult statements from respondents (Jackson 2005).

Such simple intensity measures suggest that fear of crime is stable over time, location, and situations. Analogous to the availability and representative heuristics known from behavioral science (Kahneman et al. 1982), they may exaggerate the actual (or 'average') fear of crime, because respondents recall the most salient and threatening moments of experienced fear, inferring these to be representative of their overall experience of fear of crime. On the other hand, "if the fear of crime is a pervasive emotional response to a chronic state, then focusing on specific occurrences of immediate feelings of fear will mean that these figures understate the (…) impact of fear of crime" (Dolan and Peasgood 2007, p. 128).

Therefore, more complex question sets are currently being developed asking respondents (a) whether they have felt fearful (with regards to a specific crime) within the past twelve months, (b) how often those moments of fear have occurred, and (c) how fearful they felt during the last episode of fear (Farrall and Gadd 2004). Jackson (2005, p. 301) lists an even longer list of aspects constituting fear of crime: The frequency of "worry", estimates of victimization likelihood, perceptions of control, perceptions of seriousness of consequences, beliefs about the local incidence of crime, perceptions of community cohesion, and the perception of social and physical incivilities. However, such multi-dimensional conceptions of fear of crime are extremely rare in quantitative research (Jackson 2005).

Survey questions focusing on frequency of fear of crime probably elicit more useful information in the sense that the resulting data are easier to interpret, because respondents can concentrate on 'spikes' of fear instead of making 'overall' evaluations (Farrall 2004). Moreover, limiting time horizons covered by the survey items may be a viable option to elicit more accurate enumerations from the respondents (Jackson 2005).

Another critical aspect is the choice of wording with regards to the dependent variable, i.e. the security-related attitude one wishes to study. Jackson (2005, p. 301) motivates the choice of "worry" items instead of "anxiety" or "fear", because (a) "fear is a strong physical reaction to a present

stimulus; perhaps it is too strong a word for many of the situations people feel themselves in", and (b) "anxiety may be too diffuse, never involving immediate stimuli."

However, the empirical findings revealing that "worriers can be preoccupied with negative information and future unpleasant outcomes, hyper-vigilant in scanning for salient material relating to threat (Mathews 1990), see ambiguous events as threatening (Butler and Mathews 1983,1987; Russell and Davey 1993) and over-estimate risk (Butler and Mathews 1983,1987; MacLeod et al. 1991; Vasey and Borkovec, 1993)" (id.), renders this item less useful for the purposes of the present analysis – i.e. for studying signs of disorder as a mediating factor in the genesis of fear of crime.[86]

An omitted variable bias might be a problem, if unobserved factors influence both dependent and independent variables – and given the cited literature, this seems to be a virulent issue with "worry" and "perception of disorder". Notwithstanding, these issues also apply to "fear" items.

It is possible that fears not related to crime are still being expressed as crime-related fears – maybe even if the item clearly focuses on specific 'fear of crime' and not 'insecurity'.[87] People may use the language of crime to articulate broad, affectively or cognitively processed concerns about social conditions. In that case, while these broader fears still reduce psychological well-being and physical health, the survey-based measures of fear of crime as well as the costs attributable to fear of crime would be overstated (Dolan and Peasgood 2007). Hollway and Jefferson (1997) mention the possibility that fear of crime could unconsciously serve as "a relatively reassuring site for displaced anxieties, which would otherwise be too threatening to cope with." In that case, a mere reduction of the fear of crime (as measured in surveys) might not be an appropriate objective for security policy.

An alternative to elicit information about crime and public concerns would be a systematic analysis of police call records, i.e. of their frequency, type, location, and time (Skogan 1990). It might be interesting to focus on false alarm calls, which seem to have increased in most U.S. cities (id.). "The current chronic lack of data in relation to the tangible and intangible costs in anticipation of possible victimization (*i.e., fear of crime*) provides enormous scope for future research" (Dolan and Peasgood 2007, p. 129). Such data are indispensable for improved decision-making processes relating to the allocation of scarce resources in the area of public security.

Measurement issues also arise when defining and 'quantifying' disorder. Many norms and various forms of public order are not explicitly codified and not traditionally defined (Skogan 1999). Therefore, relevant question are not just on *how* to measure disorder, but also on *what* should actually be identified as signals of disorder. In spite of its indisputable importance, that discussion lies beyond the scope of this analysis.

2.7.2 Identification

When trying to identify partial correlations and 'effects' of victimization risks, disorder, and the like on the fear of crime, a central issue is the *spatial segregation* used in the empirical analysis. Any non-experimental field study analyzing spatially segregated geographical units (such as neighborhoods)

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[86] In Jackson's (2005) structural model of the dimensions of the fear of crime, worry feeds back into perceptions of signs of disorder, increasing the tendency to interpret these as indicators for crime potential.

[87] There is some evidence for this possibility in the context of Chile. Dammert and Malone (2003, p. 79) argue that "fear of crime in Chile does not reflect fear of criminal acts per se, but is rather a manifestation of a wide range of daily insecurities. That is, fear of crime is rooted in other economic, social, and political insecurities (…)". According to them, crime is interpretable as a "scapegoat for all types of insecurities" (id., p. 80).

faces the potential problem of self-selection: People's choices of the places where they live, work, shop, or recreate are affected by fear of crime or risk assessments, and vice versa.

Consequently, property value changes, public revenues, occupancy rates in apartment complexes, job opportunities, and population shifts are endogenous to the crime situation (Stephens 1999). Mobility and financial resources are thus relevant factors when studying potential selection biases, although these problems may only be seriously controlled in field experiments, where, e.g., people are attributed randomly to certain living areas. Nevertheless, previous research failed to show consistent links between crime (or crime-related environmental conditions) and mobility (Taylor 1995a).

Adding to the issue of spatial seperability is commuting behavior, because nowadays a considerable fraction of the population in western societies does not work within walking distance of their residence. This implies that a certain part of everyday life is spent in areas outside of one's residence neighborhood.

Aspects very rarely considered are: How does someone actually 'move' when not at home? Where does a person work? How much time does the individual spend at or around home, in neighboring areas, and around the work place? Possibly, the victimization risk in neighboring districts or neighborhoods as well as in the area of a respondent's working place should also be taken into account in the empirical analyses. In order to obtain more valuable results, it will be indispensable that future research differentiates between commuters and residents.[88]

One possible approach to deal with these identification and causality problems would be quasi-experimental situations, e.g., when people are 'randomly' attributed to certain areas of residence in the framework of social welfare or other public housing programs. Another approach might be the exploitation of the temporal structure in panel data sets. Future research could try to further integrate lagged variables in long time series in order to strengthen causal inference.[89]

2.7.3 Additional Data

Several authors express critique on socio-demographic models and note that they lack some potentially relevant variables such as social context factors, 'indirect' victimization, the time actually spent in the area around one's residence, or health status (Hale 1996, Farrall et al. 2000). Besides the victimization and the social-problem approaches, which focus on victimization risk and disorder in order to explain fear of crime, there is also a social control perspective on the issue.

This approach focuses on the impact of the media and transmission of fears, i.e. on social interactions and potential forms of 'indirect victimization'. Thus, fear of crime and risk perception might be embedded in a social context of everyday communication processes and, therefore, result not only from visually but also from socially constructed interpretations of community (e.g. Smith 1989, Jackson 2004).

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[88] In the Zurich Crime Survey data, this might be an especially virulent problem in city district 1, which is the city's major business district. It is highly frequented by pedestrians (for working or shopping) and, at the same time, faces the highest crime rate of all districts (see section 2.6.1).

[89] What hinders the application of this second approach to the Zurich Crime Data set are the facts that the data structure is not panel and that only three survey waves (spanning, in total, four years) are currently available.

This raises questions about the necessity of additional data required for refining the formulation of hypotheses and the empirical analysis. Circulating representations of the risk of victimization might have a significant impact on fear of crime (Jackson 2006). Therefore, *indirect victimization* experiences

a) by family members (families as the smallest social unit),
b) by friends and colleagues at work, and
c) by the mass media

should also be taken into account in research on fear of crime.

Thus, *social interactions* and communication might also determine perceptions of neighborhood stability or interpersonal trust as well as broader anxieties about the pace and direction of social change. Indirect victimization experiences, i.e. hearing or knowing about victimization of people one knows – family members, friends or neighbors – influence the perception of victimization risks (Tyler 1980). In addition, they might even play a bigger role for the broader, more affective concept of 'anxiety' than direct victimization experiences – even though this 'hear-say' experience of crime may bias the perception of crime (Skogan 1986).

With crime reports accounting for up to 25 per cent of total news coverage (Maguire et al. 2007), there is also an ongoing debate about how *mass media coverage* shapes perceptions of victimization risk and anxieties (e.g. Stephens 1999).[90] Sensational media reportage of crime and violence in tabloid television or the movie entertainment industry might also support people in making "rapid interpretative leaps from the presence of certain people, or the occurrence of incivilities, to the possibility of criminal activities" (Jackson 2005, p. 310).

Again, fear of crime could become a way in which people express their contextual understanding of society in a more general sense. In an early study, Tyler and Cook (1984) found that exposure to media crime stories increased people's concern about crime, but neither their perceptions of vulnerability nor the perception of the security in their neighborhood.

In the context of media consumption, the notion of 'stimulus similarity' may be essential: The more the media consumer identifies with the described victim ('identifiable victim') or the situational context of the crime resembles the consumer's own neighborhood, the more the information from the mass media is being translated into personal 'fear of crime' (Winkel and Frji 1990, Stapel et al. 1994). Nevertheless, the causal ordering of the relationship between media and fear of crime remains unclear.[91]

Social cohesion and 'collective efficacy' (a concept contrasting 'self-efficacy') seem to be relevant for fear of crime (Wyant 2008). Future research will have to take into account the multiple transmission mechanisms through which representations and beliefs about victimization risks are propagated and translated, while comparing different institutional and cultural contexts.

A major concern is how to measure the kind and extent of an individual's embedding in a social context, e.g., the size of one's circle of friends or the intensity of neighborhood relationships.

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[90] Stephens (1999), therefore, suggests that it may be helpful in mitigating fear of crime if the police would provide information on crime incidence more actively, e.g. via public cable television.

[91] By disproportionately exploiting the consumers' demand for violent (versus more frequent, minor) crime stories, media might contribute to the climate of fear in a society (Farrell et al. 2009).

Farrall et al. (2000) try to deal with this issue by asking people how often they chat to people and visit friends locally. This may be an interesting extension to common victimization surveys.

Another aspect the survey conducted for this study does not explicitly account for is health status. Health might be a crucial factor with regards to an individual's vulnerability (Moore and Shepherd 2007). Health could be reflected in personal fitness.[92] Nevertheless, caution is warranted if analyzing a causal relationship between health and fear when the only data available is subjectively expressed, i.e. self-rated health.

This subjective indication could mirror a wide range of personal concerns and attitudes, such as, but not exclusively, fear or subjective feelings of insecurity. For example, Ross (1993) found a link between self-reported health and fear levels. While this observation could easily been interpreted in causal terms[93], it may simply reflect a spurious correlation with the same unobserved attitudinal dispositions.

2.7.4 Utility Considerations

Subjective security is hypothesized to depend not only on criminal outcomes but also on the conditions and processes that lead to these outcomes. This distinction has been introduced as a conceptual framework into economics at large differentiating between outcome utility and *procedural utility* (Frey et al. 2004).

In the assessment of institutions, it is important to understand whether processes themselves are a source of utility (for an application to democracy see Stutzer and Frey 2006). Recommendations for institutional design might be quite different if people appreciated autonomy, participation or self-determination beyond outcomes. Procedural utility emerges because people have a sense of self.

The concept thus incorporates a central tenet of social psychology into economics, namely that people care about how they perceive themselves as human beings and how they are perceived and treated by others. There is substantial evidence for concerns of procedural justice with regard to the working of the legal justice system (Lind et al. 1993, Tyler 1997, Tyler et al. 1997). Consequently, procedural utility considerations may play an important role when analyzing subjective feelings of fear and valuations of public security in specific institutional environments.

At the same time, there is accumulating evidence that people have difficulties predicting variation in the degree of adaptation to goods and activities (see, e.g., Wilson and Gilbert 2005). If people systematically *mispredict utility* they make biased decisions and allocate their time and money so that they experience a lower level of utility than that which they could achieve without misprediction (Stutzer and Frey 2007).

This research is similar in spirit to the one regarding 'false' security (e.g., Low 2003). Moreover, it raises difficult policy questions on whether government intervention would be warranted or whether the political process should mainly contribute to a deeper awareness of the issue within the citizenry (Frey and Stutzer 2006a).

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[92] Farrell et al. (2000), e.g., ask respondents about the perception of one's own speed whilst running compared with the 'average man'.

[93] Either a higher fear of crime causes direct mental distress or it has an indirect impact on health by hindering physical outdoor activities.

Further issues beyond the scope of this study involve the relation between crime levels, subjective fear of crime and well-being. As summarized in chapter 1, subjective fear and self-reported well-being (or 'happiness') are not independent from each other. Since there was no measure for well-being integrated in the Zurich Crime Survey, this issue has not been analyzed here. Moreover, the extent to which information about crime incidence and risks is available to (and processable by) individuals is another open question.

CHAPTER 3

The Economics of Camera Surveillance and Public Security

3.1 Introduction

3.1.1 Technological Development and Public Security

In societies challenged by a decreasing relevance of national borders considering trade and individual mobility, new ways to counteract crime and provide security draw attention in public policy debates. The development of technologies to organize, coordinate and administer human interactions on markets and in social networks has always been an integral part of human evolution. Direct and remote security and safety instruments have become and now constitute a vital part of an increasingly complex technological infrastructure. In regard to the intrusiveness of possible security measures, there is a wide spectrum of crime prevention approaches ranging from harsh sanctions of petty crimes to *laissez-faire* politics. Especially within the last few decades, technological innovations have enabled novel forms of controlling crime and public order, most notably in regard to surveillance.[94]

Camera surveillance or Closed-Circuit Television (CCTV)[95] is probably the most rapidly spreading and at the same time one of the most controversial instruments in security policy today. This fast-developing technology basically enables ubiquitous surveillance of public and private spaces, and security actors benefit from enhanced capabilities of detecting or retracing criminal activities. Moreover, camera surveillance can be interpreted as a reflection of the underlying trend towards 'decentralizing' and 'privatizing' the production of public security.

Historically, observation (surveillance) of the private and public spheres was person- or paper-based, i.e. police officers or private security personnel had to be on location in order to detect (*ex ante*) or reconstruct (*ex post*) criminal activities in public or private spheres (Surette 2005). Camera surveillance signifies (i) a general extension of public surveillance systems and (ii) a shift from direct, personal or print surveillance to remote, electronically transmitted and even computer enhanced self-monitoring, visual surveillance.[96]

Within the last decades, a shift away from policies directed at individual offenders, to policies directed at critical, 'criminogenic situations' – including "unsupervised car parks, town squares late at night, deserted neighborhoods, poorly lit streets, shopping malls, football games, bus stops, subway

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[94] For our purposes, *surveillance* is defined as the observation of people acting and objects located at a specific time and place for the purpose of obtaining information about activities and incidents happening (Lyon 1994, 2006).

[95] According to Goold (2004, p.12), *CCTV* is defined as "a system in which a number of video cameras are connected in a closed circuit of loop, with the images produced being sent to a central television monitor or recorded." Deisman (2003, p. 7) formulates it as follows: "CCTV refers to electronic monitoring systems which make use of video camera, connected by means of a 'closed' (or non-broadcast) circuit, to capture, collect, record, and/or relay visual information about the event-status of a given space over time." One can categorize active (with people watching the recorded images in real-time) vs. passive (only recording) and overt (obviously visible) vs. covert (within protective shells or domes) systems – a variety of hybrid forms being implemented as well.

[96] Second generation CCTV accelerates this process by providing digitalized images that can be automatically processed by recognition software increasing the scope of surveillance and potentially also reducing monitoring costs (see, e.g., Norris and Armstrong 1999; Surette 2005).

stations and so on" – has been observed (Garland 1999, p.19). Though CCTV may serve a huge diversity of functions, crime prevention remains definitely amongst it primary objectives (Kinzer 2004). Accordingly, it is categorized as a *situational crime prevention* measure (Clarke 1995), more specifically a technique of 'formal surveillance' (Clarke and Homel 1997).

3.1.2 Scientific Approaches to CCTV as a Situational Crime Prevention Measure

With some time lag, legal and social science research begins to follow the development in CCTV surveillance. Since the publication of Gary Becker's (1968) seminal contribution to the field, a large body of theoretical and empirical studies has evolved examining the domains of crime and punishment from an economic perspective.[97] Analyses predominantly rest upon the traditional, utilitarian axioms implied by price theory. Thus, the simple Becker-Ehrlich-model of crime predicted illegitimate behavior to occur if the expected benefits outweigh the expected costs associated with these activities (Becker 1968, Ehrlich 1973).

Underlying this approach is the idea that punitive sanctions primarily affect behavior through (marginal) deterrence. To deter criminal and undecent behavior, potential offenders must be convinced "to desist from criminal activities, delay their actions or avoid a particular target" (Siegel 1992, p. 133). A deterrent effect is obtained if the following assumptions are met: The potential perpetrator (a) must be aware of CCTV; (b) must be motivated to avoid detection, identification and apprehension; (c) must outweigh the potential gains associated with the intended behavior against these negative motivational and cost factors; (d) must be capable of rational thinking instead of obeying impulse; and (e) must, in the end, decide not to commit the intended undesirable activity (Deisman 2003).

An effective and cost-efficient legal framework can then be accomplished by harsh sanctions put into practice in combination with small probabilities of detection. Further research has attended to empirically separate the effects of deterrence from those of other impacts of anti-crime policies, such as incapacitation effects resulting from incarcerating criminals (Ehrlich 1981, Kessler and Levitt 1999, Glaeser and Sacerdote 2000).

Technological and institutional innovations enable the implementation of alternative measures to combat crime beyond the traditional channels of deterrence and incapacitation. In recent years, a seemingly limitless expansion of electronic surveillance of public and private spaces can be observed (Norris and Armstrong 1999). In this respect, probably the most salient phenomenon in public discourse is the rapidly spreading application of CCTV.

Especially in the U.K., the deployment of CCTV has been triggered by cases of investigation successes attributable to CCTV images: In February 1993, the kidnappers and murderers of two-year-old Jamie Bulger could be identified due to CCTV footage in a shopping center in Bootle, Merseyside (British Broadcasting Corporation 2000b). CCTV was also in public focus surrounding the Brixton nail bomber David Copeland in 1999 (British Broadcasting Corporation 2000b) and the failed terrorist bombing of the London Underground system in 2005 (British Broadcasting Corporation 2005a). Such success stories with an enormous publicity decisively contributed to the acceptance of CCTV in the

[97] Recently, a broad literature evolved addressing the relationship between policing and crime, partly exploiting natural experiments, e.g., see Levitt (1997), McCrary (2002), Di Tella and Schargrodsky (2004), and Klick and Tabarrok (2005).

U.K. (Cavoukian 2008). These high profile cases also changed the view from considering CCTV's value primarily in its deterrent potential to regarding crime detection as a primary goal of the technology (id.).

While the deployment of CCTV had mostly been limited to private areas until the mid-1980s (Hempel and Topfer 2002), CCTV is now used to monitor not only private spaces (such as workplaces, shopping malls, car parking facilities, taxis, bank entrances, automatic teller machines, casinos, airports, and several indoor environments), but also an ever-expanding range of public spheres (such as city and town centers, squares, streets, parks, public transportation systems, police stations, hospitals or schools).[98]

In Britain, camera surveillance is the single most heavily funded non-criminal justice crime prevention measure and has accounted for more than three-quarters of total spending on crime prevention by the British Home Office at the turn of the century (Welsh and Farrington 2003). But some researchers also categorize the deployment of CCTV systems and the private policing of (semi-)public space as part of a new 'fortress impulse' (Bannister et al. 1998). Public messages such as Glasgow's slogan 'CCTV doesn't just make sense – it makes business sense' encourage private commitment to and public support of CCTV (Fyfe and Bannister 1994). Additionaly, but not in the focus of this study, CCTV is increasingly being used as a traffic control measure (in the context of congestion, road-pricing schemes, etc.).

On a politico-economic level, CCTV also reflects a 'responsibilisation strategy' designed to off-load and decentralize risk management from central government authorities to local public and private organizations mobilizing powerful special interest groups from local authorities and police, private security and surveillance industry, the media, insurance companies, etc. (McCahill and Norris 2002).

This development has so far attracted attention mainly in criminological, sociological, technology-oriented and urban planning research (e.g. Norris et al. 1998; Painter and Tilley 1999; Surette 2005). Previous scientific coverage of the topic lacks a comprehensive analysis of the behavioral reactions of the involved actors from a rational choice perspective that takes up insights from economics and psychology.[99] Experts criticize the varying degrees of quality and competence as well as the frequently observed lack of independence of many CCTV evaluations, e.g., from the British Home Office who funded many U.K. studies (Ditton and Short 1999, Ditton 2000, Wilson and Sutton 2003, 2004, Eck 2006, Welsh and Farrington 2007). These deficits become evident, e.g., in Surette (2005, p. 152) quoting Williams and Johnstone (2000): "CCTV is an academically ignored topic."

Thus, while technological developments in camera surveillance systems are proceeding at a rapid pace, not even the effects and implications of first generation applications have been sufficiently assessed or comprehended (Nunn 2003). Meta-analyses of initial evaluations of camera surveillance systems indicate, but not without exceptions, that their installation has resulted in (small) reductions in crime – although with major caveats regarding context dependence etc. (for an overview, see Welsh and Farrington 2003, 2007). Thus, while especially British politicians rapidly began to place emphasis on CCTV systems, "no body of scientific evidence existed at the time they were adopted that could either support or refuse claims to such (deterrent) effects" (Deisman 2003, p. 2).

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[98] At the same time, the distinction and legal delimitation between private and public spaces is increasingly becoming blurred (Deisman 2003).

[99] From the few contributions (partly) including an economic analysis, see e.g. Ruegg et al. (2006).

The specific cognitive and emotional mechanisms influencing subjective perceptions of security and inducing behavioral reactions in the presence of camera surveillance are yet to be scientifically examined. Surette (2005, p. 152) advises not to adopt camera surveillance systems as "an automatic response to a public security problem" and their application "not [to] be decided simply on the technology's availability or cost." Additionally, "advancing knowledge about the crime prevention benefits of CCTV programs should begin with attention to the methodological rigor of the evaluation designs" (Welsh and Farrington 2003, p. 131).

3.1.3 Research Focusing on Switzerland

Pioneering work covering specific aspects of camera surveillance in the institutional context of Switzerland is by Ruegg et al. (2006). Their study has benefited from a broad research team including people with a legal, geographical and sociological academic background. In a research project funded by the Swiss National Science Foundation in 2004 and 2005, they studied the socio-technical mediations within the decision-making processes involved in installing and operating camera surveillance systems.[100]

The two case studies undertaken in Ruegg et al. (2006) are based on experiences of the public transportation providers in the canton of Geneva and of the International Airport of Geneva. It is found that perceived risks and subjective insecurity play a pivotal role in legitimatizing the installation and diffusion of video surveillance. The researchers also conclude that "des evaluations indépendents devront être conduites dans le futur pour tenter de lever ces interrogations" and they recommend to „procéder à des évaluations indépendantes de l'efficacité et de l'efficience de tels dispositifs" (Ruegg et al. 2006, résumé). At the same time, they point out that „les difficultés méthodologiques de telles études ne doivent cependant pas être sous-estimées" (id.).

3.1.4 Outline

This chapter formulates the foundations for an empirical evaluation of camera surveillance differing from Ruegg et al. (2006) in fundamental respects. The conceptual work focuses on behavioral consequences of camera surveillance from a cross-disciplinary economic and psychological perspective. Ruegg et al. (2006) primarily pursued a jurisprudential (analyzing the legal corpus applicable on camera surveillance), sociological (deliberation and interactions between actors in the security sector) and technological (configurations of camera surveillance and their technological evolution) perspective.[101]

In this report, an economic perspective on CCTV is persued along the following two initial questions: (1) How effectively does the video camera surveillance of public and private spaces contribute to the production of public security? (2) Is this form of institutionalized control accompanied with incentive-based substitution effects, adverse behavioral responses or motivational spillovers to other spheres of life?

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[100] To the knowledge of the author, there exists only one other socio-scientific study on CCTV in Switzerland, again focusing on CCTV from a sociological perspective (Klauser 2006).

[101] For recent advances based on sociological approaches, see, e.g., Lyon (1994) and Reeve (1998); for 'critical' criminological literature on this issue, see, e.g., Feeley and Simon (1994), Garland (1996), or Stenson and Sullivan (2001); and for urban geographer literature, see Davis (1990), Christopherson (1998), or Bannister et al. (1998).

In the following chapter 3.2, the conceptual mechanisms underlying potential deterrent effects of CCTV on criminal behavior are outlined, while section 3.3 provides evidence on crime-reducing effects in various specific contexts. Chapter 3.4 outlines unintended side effects potentially accompanying CCTV surveillance including respective evidence where available. Subjective valuations of CCTV as a crime prevention measure are discussed in chapter 3.5. Section 4.2 summarizes the fundamental insights of the existing evidence and concludes.

3.2. Camera Surveillance as a Crime Deterrent: Theory

3.2.1 'Desired' Effects of CCTV: Deterrence and (Deterring) Detection

By triggering perceptual mechanisms in potential offenders, CCTV aims to increase the perceived risk of being detected, captured and possibly arrested. This should raise the costs of criminal behavior for a (limited) rational potential offender. Focusing on the supervising and deterring function of CCTV, the traditional economic approach to crime implies that the dissemination of camera surveillance enhances control capacities, leads to a partial replacement of human capital by technological investments, and thereby increases productivity and efficiency of policing. Hence, CCTV-systems should induce a substitution of illegitimate for legal and decent behavior and ultimately reduce crime in the monitored area.[102]

Recorded images are also utilizable ex post as they support crime scene investigations or serve as proof material. Consequently, this new electronic surveillance technique is expected to have positive first-order effects both on efficiency and effectiveness of security production – it enables broader detection capabilities at equal costs resulting in a reduction of crime and an increase in public security.[103]

Most of the previous debate on CCTV systems focuses on its "potential benefits and the risk of violations of individual privacy" (Welsh and Farrington 2007, p. 5), often ignoring a wide range of potentially unintended behavioral consequences as well as cost-effectiveness considerations. Evidence from various studies suggests that the crime-reducing effect of CCTV is (a) relatively small and (b) very much dependent on the situational context where cameras are in operation.[104] Ratcliffe (2006, p. 17) states that while "perceptions are usually positive, (…) evidence of actual crime reduction is harder to find." Empirical evidence for different contexts will be shortly referred to in the following chapter.[105]

3.2.2 Possible Deterrence Mechanisms of CCTV

There are several possible explanations why CCTV is probably the most popular situational crime prevention tool at present. Arguments employed in public discourse and political decision-making processes involve a wide range of behavior-relevant aspects. Various *mechanisms* by which CCTV possibly deters criminal activity are articulated in Armitage et al. (1999, 226-227).[106]

The main mechanisms are founded in considerations of deterrence (a-c), but some less conventional behavioral effects are also included (d-f):

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[102] Although the reduction in crime and public disorder is widely regarded as the primary objective of CCTV, its salutary effects on public fear of crime or feelings of safety more and more come into the center of interest (see, e.g., Deisman 2003 as well as Gill and Spriggs 2005). This issue is discussed below in section 3.3.

[103] Other potential benefits of CCTV, such as supporting the provision of medical assistance or facilitating place management and information gathering (e.g. for marketing purposes) are beyond the scope of this study. For a short discussion of some of these issues, see Ratcliffe (2006).

[104] For an overview of previous empirical analyses, see Welsh and Farrington (2003).

[105] In analogy to Welsh and Farrington (2003, 2007), the minimal requirements for inclusion of an evaluation study is that CCTV was the main intervention in the area analyzed and there were measures of crime (statistical data and/or surveys) before and after the intervention in experimental and comparable control areas.

[106] See also Surette (2005).

(a) *Deterrence* of 'criminal and socially offensive behavior' (Surette 2005, p.153) by signaling an elevated risk of apprehension, i.e. the costs of crime rise if CCTV is perceived as reducing the time available to commit crimes;[107]

(b) *Detection, identification* and possibly *incapacitation (arrest)* of offenders as well as potential witnesses (who may otherwise be reluctant to come forward) is a first potential benefit of CCTV simply working as an evidence-gathering tool regarging crime, traffic control, etc.;

(c) *Effective deployment (and intervention)* of security personnel or police to critical situations and thereby aiding apprehension of suspects as well as police officer safety;

(d) More (cautious and security-minded) people frequent monitored areas, i.e. pedestrian usage of public places increases, enhancing *natural surveillance* and informal surveillance, thereby raising subjective probability of detection;[108]

(e) CCTV might signal an effort to take crime seriously *encouraging* law-abiding citizens and *personal surveillance* (by stimulating moral courage, community pride and cohesion);

(f) The visibility of cameras may induce people to take elementary security precautions. This can occur by simply *jogging their memory* or for anticipated fear that they will be *shamed* due to being shown on CCTV.[109]

Furthermore, CCTV is capable of capturing police deviance and providing independent evidence thereby useful as a *police management and supervision tool* (Surette 2005). In sum, there are various mechanisms other than deterrence why CCTV may be supportive to crime prevention and police operation. This may help explaining the strong public and political support and thus the proliferation of CCTV schemes (Cavoukian 2008).

Additionally, possible indirect or spin-off benefits of enhanced public security in a specific area such as raised property values and lower insurance premiums in the respective area have been sporadically hinted at (Deisman 2003), but these – from an economic point of view decidedly relevant – effects have not yet been analyzed empirically. Therefore, the market internalization of the presence of CCTV schemes and specific crime levels might need to be reflected in future research. Although the possible ways through which CCTV might work as intended are numerous, the relative importance of the specific mechanisms as well as their respective consequences remain unresolved (id.).

Diffusion of Benefits. There is also a possibility that the above-mentioned crime-reducing benefits of CCTV territorially spread beyond the areas directly monitored by cameras. This can happen if potential offenders are aware of the presence of CCTV but unaware of its capabilities or the covered range. This 'unintended' and territorially extended decrease in criminal behavior is referred to as *'diffusion of benefits'* or simply *'diffusion'* (Clarke and Weisburd 1994). Most importantly, only very few

[107] To have a deterrent effect, cameras do not even necessarily need to be operational (Brown 1995), even the publicity or the announcement of a plan to install CCTV can be deterring (Armitage 2002, Deisman 2003). This publicity surrounding CCTV must be maintained if any crime reduction effects should not fade (Norris et al. 1998).

[108] In fact, people rarely changed their behavior in the aftermath of CCTV installation: According to Gill and Spriggs (2005), only two to seven per cent of respondents visited areas they previously avoided.

[109] Shaming has also been shown to be an effective deterrence mechanism in the context of antilittering campaigns (Grasmick et al. 1991).

empirical evaluations even try to measure diffusion of benefits following the installation of CCTV schemes. Most of the (scarce) evidence suggests some degree of beneficial diffusion.

Armitage et al. (1999), Short and Ditton (1995), and Brown (1995, on Newcastle Upon Tyne) provide evidence for diffusion within the context of city centers and public housings, whereas in Williamson and McLafferty's (2000) evaluation, diffusion did not occur. Regarding public transportation, only Webb and Laycock (1992) provide evidence for diffusion in the London Underground. Poyner (1991) finds some diffusion of benefits in his study of the University of Surrey parking lot.

Need of Personal Presence. Cameras *per se* lack any interventionist power and, consequentially, personal presence of authorities is indispensable for instantaneous enforcement of law and order. Webb and Laycock (1992) have already argued that either security staff actively intervening or prompt police response to incidents in monitored areas is crucial for the effectiveness and credibility of CCTV.

In reality, the ability to mobilize a fast response is often constrained not just by the fact that CCTV operators cannot intervene themselves, but also because they often are not in a position to demand police intervention (McCahill and Norris 2002). Furthermore, installations of camera schemes are occasionally being used as an excuse to cut police patrols (Clark 2008).

3.3 Camera Surveillance as a Crime Deterrent: Context-Specific Evidence

The effectiveness of CCTV is evaluated according to the various *situational settings* within which CCTV is implemented. A context-bound approach provides valuable information for the political process (Welsh and Farrington 2007). Moreover, a context-specific evaluation is necessary for the assessment of institutional and environmental factors influencing the way a specific situational crime prevention measure such as CCTV works (including the cost-benefit relation).

In the following section, pioneering as well as more recent evaluation studies are systematically linked to a broad set of situational contexts. After summarizing this evidence, the underlying methodological approaches and some involved statistical difficulties and uncertainties are critically discussed.

3.3.1 City and Town Centers

Most of the CCTV evaluations available at present focus on public areas in town or city centers, mostly squares or crossroads fronted by shops, restaurants and/or bars. It must be mentioned that city centers have characteristics that are seldom matched in control areas within the same city: (1) They are often frequented but only very few of the passers-by actually live there and (2) the level of pedestrianization can differ significantly from other areas (Ditton 2000). Both of these features can have impacts on actual crime and on subjective security.

In their meta-analyses, Welsh and Farrington (2003, 2007) use *odds ratios* as comparable and easily interpretable measures of effect size. Odds ratios are calculated as follows: If the number of crimes in the experimental area (vs. the most comparable control area) before CCTV installation is v (versus x) and after CCTV installation w (vs. y), the odds of a crime after, given a crime before is a=w/v (versus b=y/x).

The odds ratio, r=b/a, directly indicates the proportional change of crime in the control area compared with the experimental area. If it is significantly higher (lower) than 1, it indicates a crime-reducing (crime-increasing) effect of CCTV.[110] Evaluations analyzing CCTV in *city centers and public housing* deliver mixed results:

i) CCTV evaluation studies focusing on the *United Kingdom* show significant heterogeneity: Some suggest a *small positive, i.e. crime-reducing effect*.[111] Mainly, the strong and robust research design chosen by Short and Ditton (1995) provides significant support for CCTV as a crime prevention measure. Sarno et al. (1999) attribute a decline in street robberies to CCTV in an area around a large London shopping mall, although they only find null or uncertain effects in two of the three London Borough of Southwark areas studied.

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[110] Assuming that the crime numbers (v, w, x, y) are Poisson distributed, the natural logarithm of the odds ratio is used for calculating its variance (Fleiss et al. 2003; Piquero et al. 2003). Because of the potential existence of many additional crime-relevant influences, a more conservative estimate of the variance is obtained by correcting for overdispersion, where the variance of the number of crimes exceeds the number of crimes. For additional information on odds ratios, see the technical appendix in Farrington et al. (2007b). The odds ratio as a statistical measure is critically discussed in section 3.3.7.

[111] Brown's (1995) study on street areas with full/partial/no CCTV in Birmingham, Short and Ditton (1995) or Ditton and Short (1999) evaluating the town center of Airdrie in Scotland, Skinns' (1998) on CCTV in commercial areas of Doncaster, Squires (1998) on Ilford Town Centre CCTV, and Armitage et al. (1999) who find that the effect is strongest on vehicle crimes and burglary in Burnley.

Ditton et al. (1999a) find only a small effect of CCTV on crime in Glasgow city center, though the 32 cameras have helped with some major investigations. In the most recent empirical study on CCTV in the U.K., Gill and Spriggs (2005) find desirable effects in the Borough Town as well as the Shire Town schemes, both actively monitored and with high camera coverage of the town center area. At the same time, their evaluation of the South city scheme showed a null effect despite its high camera coverage (id.).

One study not included (possibly due to reasons of methodical rigor) in Welsh and Farrington's (2003, 2007) reviews focuses on CCTV and crime in Canadian Sudbury, Ontario (KPMG 2000). The consultants estimate 300 to 500 criminal offenses deterred by CCTV in the year after implementation and calculate corresponding monetary savings of 800'000 Canadian Dollars. Additionally, drug- and prostitution-related arrests increased by 18 per cent, leading KPMG (2000) to the conclusion that CCTV was effective both in deterring and in detecting crime.

Other studies on CCTV in the United Kingdom show a *small negative, i.e. crime-increasing effect*. Among these are Musheno et al. (1978), Brown (1995) on Newcastle-upon-Tyne including 20 different crime types and an evaluation period of 41 months, Sarno's (1996) evaluation of CCTV in the London Borough of Sutton, and Farrington et al. (2002, 2007a) on CCTV in the city center of Cambridge.

Farrington et al. (2002) find a null effect of CCTV on the category of vehicle crimes in town centres, while Brown's (1995) evaluation suggests a reduction of around 50% in each burglary, theft from vehicle and vehicle theft. Gill and Spriggs' (2005) evaluation of the CCTV project in Market Town, where the camera coverage amounted to only 34 per cent of the area, revealed an undesirable effect.

Using innovative empirical data on hospital admissions and officially recorded crime, Sivarajasingam et al. (2003) study multiple city and town centers in the U.K. and find inconclusive evidence regarding CCTV and violent crime: CCTV seemed to have desirable, i.e. reducing effects on emergency department admissions but undesirable effects on crime recorded by the police, i.e. the latter numbers increased in the aftermath of CCTV installation.

ii) The few evaluations analyzing CCTV in the *United States* homogeneously find a *null effect*, i.e. neither a significant positive nor a significant negative effect on crime. Pioneering the empirical analysis of CCTV in the U.S., the three evaluations reported in Mazerolle et al. (2002) focus on CCTV schemes in Cincinnati, using calls for service as well as police records corresponding to the three city-center sites (Northside, Hopkins Park, and Findlay Market). A very recent report by Cameron et al. (2008) also does not find any statistically significant effect of CCTV on violent and property crimes in two locations in Los Angeles, California (Jordan Downs, Hollywood).

iii) There are also two studies evaluating CCTV in city centers in *Scandinavia* available so far. Blixt (2003) analyzed violent crimes (assault and robbery) in the context of CCTV surveillance of a city center square in Malmö, Sweden. She finds a significant *crime-reducing effect*, although the pictures are only passively monitored. Two CCTV evaluations not covered by Welsh and Farrington (2003, 2007) find desirable effects in the city center of Amsterdam (Flight et al. 2003) and in the Kabukicho district of Tokio (Harada et al. 2004). Winge and Knutsson (2003) study

CCTV's effect on multiple crime categories in Oslo (Norway) city center near the central railway station and find a (significant) *undesirable effect*.

Thus, evaluations on city or town center CCTV show very mixed results. Pooling the data from the *U.K.* shows a positive but non-significant crime-reducing effect of around ten percent, while the five *non-U.K.* studies reveal a non-significant undesirable effect (Welsh and Farrington 2007). *Pooling* all available evaluations from the U.K., the U.S. (excluding Cameron et al. 2008) and Scandinavia, "there was evidence that CCTV led to a small (7%) and non-significant reduction in crime in city and town centers" (id., p. 31).

3.3.2 Public Housing Projects

Several studies have investigated the effects of CCTV in high-rise public housing projects located mostly in urban areas (in the U.K. and the U.S., exclusively). The two evaluations originating in the U.S. do not find any support of a crime-reducing effect of CCTV: Musheno et al. (1978) uses a victim survey to analyze CCTV in three New York apartment buildings (with a control group also consisting of three buildings within the same Bronx public housing project), without finding a certain effect in either direction. Williamson and McLafferty (2000) focus on crime measured in police reports in a Brooklyn public housing project and suggest a null effect of CCTV surveillance.

The first study analyzing CCTV and public housing in the U.K. is on the Greater Easterhouse Housing Estate in Glasgow: Hood (2003) finds a significant desirable effect. Gill and Spriggs (2005) explore six public housing projects in various locations: In two Estates each, they observe desirable, uncertain, and undesirable effects.

Thus, the results regarding CCTV's crime-reducing effectiveness are mixed and inconclusive also for the context of public housing projects in urban areas: Three studies showed a desirable (crime-reducing), two an undesirable, three an uncertain, and one a null effect of CCTV on crime. Pooling all public housing studies resulted in a small 7 per cent crime reduction effect of CCTV, which was not statistically significant (Welsh and Farrington 2007).

3.3.3 Public Transportation Systems

Far fewer studies analyzed the impact of CCTV for *public or mass transportation systems*, an area of large relevance for European countries regarding the current deployment of CCTV (see, e.g., Hempel and Toepfer 2004, British Broadcasting Cooperation 2005b). All evaluations mentioned here analyze underground railway systems, which possibly differ in essential characteristics from transportation infrastructure above ground. Moreover, there has been no recent methodologically comprehensive evidence about CCTV effectiveness in public transportation for more than a decade.

Welsh and Farrington (2007) identify three studies assessing the impact of CCTV (30-130 cameras per scheme) in the London Underground[112] and one study focusing on the Montreal Metro system in Canada.[113] All London Underground programs involved additional interventions besides CCTV such as the installation of improved lighting, mirrors, passenger alarms, public notices referring to the cameras, and special police patrols preceding CCTV. These evaluations present mixed and

[112] One study by Burrows (1979) and two by Webb and Laycock (1992).

[113] Grandmaison and Tremblay (1997). They do not include Poyner (1992) studying vandalism on buses, which was reduced by CCTV.

conflicting evidence on the effectiveness of CCTV, thereby not taking into account additional interventions implemented simultaneously. Both programs that showed a desirable effect were accompanied by other interventions.[114]

At the same time, another project analyzed in Webb and Laycock (1992) is limited to one specific subway station (Oxford Circus station) and presents an undesirable effect. The only non-UK evaluation, Grandmaison and Tremblay (1997), suggests a null effect of CCTV – especially for the crime types of robbery, theft and fraud. Of these four studies, only Burrows (1979), where the absolute number of crimes after CCTV was very small, delivers statistically significant results. Combining all studies involving public transportation systems, Welsh and Farrington (2003, 2007) observe a desirable (23 per cent reduction) but not statistically significant effect of CCTV on violent crimes in experimental compared to control areas.

The only existing evaluation studying the effects of CCTV in a *Swiss* public transportation system focuses on Geneva (Ruegg et al. 2006). Notwithstanding the methodological shortcomings,[115] they find no crime-reducing effect of camera surveillance – neither on pick pocketing nor on aggression against personnel and clients. Moreover, they state that "l'inefficacité des caméras face à la recrudescence du vol à la tire ne finisse par avoir des répercussions negatives sur la crédibilité de la vidéosurveillance pour améliorer le sentiment de sécurité des passagers" (id., p. 150).

3.3.4 Car Parks

Six studies, all focusing on the U.K., evaluate the effect of CCTV on theft from vehicles in *car parks or parking lots*.[116] All of these evaluations involve multiple other interventions, including rather 'weak' measures such as improved lighting, painting, and notices of CCTV, but also overnight locking, fencing, enhanced payment schemes and more security officers. Still, CCTV is regarded as the main intervention in all of these studies (Welsh and Farrington 2003, 2007).

Besides Poyner (1991), all evaluations show a sizeable and significant, crime-decreasing effect of CCTV in car parks. The main crime measures were theft of and theft from vehicles. The combined odds ratio of the six studies was 2.03 and highly significant, implying a decrease of vehicle crimes in the monitored area by 51 per cent (Welsh and Farrington 2007). Including the other three evaluations providing some information about vehicle crimes[117] slightly reduces the size of the effect but does not alter the key result (Welsh and Farrington 2003).

There are several potential reasons for CCTV's relatively high effectiveness in car parks: First and foremost, Welsh and Farrington (2003, 2007) admit that CCTV was always implemented simultaneously with other measures. In fact, this renders their approach of analyzing simple odds

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[114] Burrows (1979), who concentrates on the southern sector of the London Underground and finds a desirable effect on theft and robbery; and one of the three pilot projects in Webb and Laycock (1992) involving the expansion of CCTV in six stations on the south end of the Northern line.

[115] E.g., only eleven or 4.4% of all buses operating in Geneva city were equipped with CCTV at the time studied (2004) and the number of security-relevant incidents registered and considered in the analysis was simply too small and the time period too short (CCTV had been active for less than four months) to allow for any statistically relevant conclusion.

[116] Poyner (1991) analyzes a parking lot at the University of Surrey in Guildford with one non-CCTV covered car park as control. The three evaluations reported in Tilley (1993) study the intervention context of car parks in Coventry, Bradford, and Hartlepool, using one or two adjacent car parks as control areas. Sarno (1995) analyzes three car parks in a part of the London Borough of Sutton police sector. Finally, Gill and Spriggs (2005) study CCTV's effect in 57 train station car parks across the U.K.

[117] Brown (1995), Armitage et al. (1999), and Farrington et al. (2002).

ratios practically useless in regards to isolating CCTV's effect on crime. Second, they suggest that targeted offenses such as vehicle crimes may be easier to detect and deter by CCTV than impulsive, violent crimes. Third, camera coverage was generally very high in car parks, a factor that is positively related to effectiveness (Gill and Spriggs 2005, Welsh and Farrington 2007).

3.3.5 Other Situational Contexts

Some small-scale research indicates that CCTV has a certain positive effect in closed *commercial locations* such as shops (Van Straelen 1978, Burrows 1991, Tilley 1993, Gill and Turbin 1998; to some extent also Brown 1995, Short and Ditton 1995, Skinns 1998, Squires 1998) and small businesses (Hearnden 1996).

Van Straelen (1978), e.g., reports in a very early and general study on crime prevention a 33% reduction in losses resulting from theft following the installation of CCTV in a French supermarket. Brown (1995) found a decrease of burglary in shops, but this coincided with the implementation of other measures besides CCTV. Short and Ditton (1995) found a reduction in Airdrie shoplifting, while in Squires (1998) and Skinns (1998), shoplifting remained constant after CCTV installation.

Gill and Spriggs (2005) also analyzed three public settings that are not attributable to one of the above context categories. Two evaluation studies took place in British *residential areas* but differed in central respects: On the one hand, the scheme in *City Outskirts* was accompanied by several other interventions, cameras were fixed, and camera coverage high.[118]

Consequently, Gill and Spriggs (2005) find a significant desirable, i.e. diminishing effect of CCTV on crime here. On the other hand, there were no additional interventions along with the *Borough* scheme, re-deployable cameras were used, and camera coverage was low. Gill and Spriggs (2005) observe an almost significant undesirable effect of CCTV here. A third evaluation by the same authors analyzed CCTV implemented in a *city hospital* and found a desirable but non-significant effect on crime (id.).

Recently, first evidence in respect to CCTV and sport stadiums has been provided in Priks (2008). He exploits a natural experiment with exogenous (to previous incidents) variation in CCTV installation dates with a research design that he claims to be "a unique possibility to address problems regarding endogeneity, simultaneous policy interventions and displacement effects" (Priks 2008, p. 1). In the focus of the survey are the effects of CCTV on what is termed 'unruly spectator behavior' inside soccer stadiums. Priks (2008) concludes that at least 65 per cent of unruly behavior was reduced and no displacement to the area directly surrounding the stadiums was observed.

Though Priks (2008) uses a methodologically interesting evaluation design, several sensitive, critical remarks may be made here (this criticism applies to the majority of previous evidence). First, he uses a narrow definition of 'unruly behavior' (small objects thrown onto the field). Second, there are few incidents (if any) per game. Third, the reporting of incidents by one person, the referee, is highly subjective. Fourth, another definition (and data source) for 'unruly behavior' outside of stadiums (police reported disturbances and hooligan fights) is used and directly compared to the first one to measure displacement.

[118] The degree of camera coverage is usually positively and significantly correlated with CCTV effectiveness (Farrington et al. 2007b).

Fifth, there is only a small variation in most of the CCTV introduction dates, especially considering the fact that each team plays no more than 13 games a year, the number of incidents is collapsed in two-week periods, and the time trends are controlled for with monthly fixed effects. Finally, other security-related measures besides police presence have not been controlled for (such as private security organizations, lighting, cleaning, fencing, selling of alcoholic beverages, information campaigns, jurisdiction on hooliganism, etc.), and it is uncertain whether the average 19 to 24 police officers per game are the only security measure in the highest Swedish soccer league. These aspects leave some doubts about Priks' (2008, p. 12) conclusion that "the reduction in unruly behavior can therefore fully be derived from the use of cameras."

3.3.6 Summary and Critique of Previous Evidence

In sum, empirical studies regarding the effectiveness of CCTV as a measure intended to reduce crime show significant heterogeneity. To say the least, "there is considerable disparity in the views relating to its efficacy" (Cavoukian 2008, p. 3). Welsh and Farrington's (2003) first meta-analysis showed significant heterogeneity in existing evaluations: While the evaluations from the U.S. and Canada showed no significant and robust effect when pooled, the available U.K. studies combined showed a significant desirable effect (7 per cent crime reduction) but, again, with considerable heterogeneity between and even within the specific context categories. In fact, only around half of the studies regarding the U.K. showed a significant crime-reducing effect. And this finding is essentially driven by the effectiveness of CCTV regarding vehicle crimes in car park schemes.

A recent update to that meta-analysis – adding another 22 CCTV evaluations originating from January 2001 until December 2006 – does not alter the previous insights (Welsh and Farrington 2007): Although pooling all CCTV studies results in a slightly significant crime decrease (now 16 per cent), this overall result is again fundamentally driven by car park CCTV systems (which caused a 51 per cent reduction primarily in vehicle crimes). CCTV in city centers, public housing projects and public transportation lead to reductions between 7 and 23 per cent, but these (relatively smaller) effects were statistically not significant (id.). Nothing is said neither in most of those studies nor in the meta-analysis about the relative effectiveness of CCTV compared to other situational crime preventions measures.

More than half of the studies showed no effect of CCTV at all while three studies even showed a negative effect. Still, schemes studied within the U.K. seem to be more effective than those implemented in other countries, although the validity of this conclusion seems to be biased by the dominance of car-park related studies in the U.K. In an earlier CCTV evaluation review, Phillips (1999) has already concluded that the effect of camera surveillance is more obvious in regard to property crime (such as vehicle crime) than to personal crime and public disorder.

Out of the 13 CCTV schemes studied in one of the broadest CCTV evaluation studies (also cited in Welsh and Farrington, 2007), Gill and Spriggs (2005), only two show a statistically significant reduction in crime relative to the respective control area, and in one of these two evaluations, the change in crime could be attributed to confounding factors.[119]

[119] Moreover, no significant decrease in *reported victimization* occurs in target versus control areas (Gill and Spriggs 2005).

Although the ideal context factors as well as timing considerations[120] for CCTV to be effective still need to be identified, according to the reported results, CCTV schemes seem to be most effective in car parks. The main issue with these studies is that all of them (a) take vehicle-related crimes as the only outcome measure and (b) involve various other interventions blurring the interpretation of a causal relation.

In general, Ratcliffe (2006) suggests that small, well-defined areas and city streets with long, clear lines of sight may be more amenable to CCTV surveillance than broad and open with bad visibility. This suggestion raises the issue of a possible selection bias, if CCTV is only being applied where these conditions are given and where it is supposed to be most effective. Then, the general effectiveness of CCTV as a crime prevention tool might be overestimated.

Several further *critical comments* need to be made considering the vast majority of existing CCTV evaluations as well as the most often cited meta-analyses by Welsh and Farrington (2003, 2007). Practically all studies showing a significant desirable effect of crime included a package of additional (and often simultaneously implemented) interventions and crime-prevention measures besides CCTV. Additionally, camera coverage or 'density' varied considerably between the various schemes but has not been analyzed until very recently (e.g. Farrington et al. 2007b).

Odds ratios, which are generally used in meta-analyzing CCTV evaluation studies, are by no means very powerful statistical measures, but they are often based upon the only information regularly provided, the total number of crimes before and after the intervention. It is, e.g., not possible to isolate CCTV's effect on crime and statistically control for other crime-relevant factors without further information about alternative security measures and without making use of more sophisticated econometric estimation tools such as multiple regression or time series analysis (instead of crude before and after comparisons).

Therefore, caution is generally indicated when interpreting the evidence on CCTV's crime-reducing effects summarized in recent literature (e.g., in Welsh and Farrington 2007). Especially with regards to the British car park studies, where CCTV was introduced simultaneously with a range of other security-related measures, it is not possible to accurately control for such confounding factors in simple before-after comparisons of aggregated crime incident numbers.

Future approaches to study the isolated effect of CCTV as a situational crime-prevention measure may rather focus on multiple regression based on a longitudinal design to control for security-related and community-level factors (besides prior crime) as well as for time trends and seasonal variation. In face of the usually small numbers of criminal records, to carry out validity and statistical power analyses might also be helpful for future research (Cohen 1988, Farrington and Painter 2003).

Consequently, it appears a bit premature, when Welsh and Farrington (2007, p. 46) ask "what lessons can be drawn from the U.K. studies to help improve the crime prevention effectiveness of CCTV use in other countries?" And the following statement that "it is possible that the absence of other situational or social crime prevention measures in the non-U.K. CCTV schemes may be a contributing factor to

[120] One would, e.g., expect larger effects for the first cameras installed for a given surveillance technology. Later cameras might have smaller effects due to habituation in a 'camera arms race' or displacement.

their overall poor effect in reducing crime" (id., p.47) reflects the essential problem of any policy evaluation.

To say the least, Surette's (2005, p.153) statement that "while not without exceptions (…) the consensus from the evaluations of first generation CCTV systems is that reductions in crime have resulted from their installation" is slightly disproportionate considering the indisputably conflicting evidence. But it is certainly still the case that "how, when, and why (CCTV works) remains unspecified" (id.). Deisman (2003, p. 2) concludes that "the effects of CCTV on crime are both quite variable and fairly unpredictable."

Thus, the objective of future social-scientific research on CCTV should be an attempt to identify the necessary preconditions and (institutional) context factors under which a successful application of this new technological device is possible. This might be possible by taking into consideration new evaluation designs, such as (quasi-)experimental approaches to evaluate evidence on criminal or 'anti-social' behavior under various security policies.

3.4 Possible Side Effects of CCTV Surveillance: Theory and Evidence

CCTV might also cause unintended 'side-effects' potentially undermining or even reversing the expected reduction in crime.[121] Those adverse effects can be explained partly by classical economic considerations and partly by empirical regularities observed in contemporary behavioral research. Manifold short-term reactions and also longer-term adjustments of individual behavior patterns are conceivable in the context of camera surveillance.

Concluding his report on technological advancements in CCTV, Surette (2005, p. 165) notes that "applications should be cautious, not automatic. To jump to a technology solution not only may not work but may have negative unanticipated social consequences." Thus, "CCTV could also cause crime to rise" (Welsh and Farrington 2007, p. 10).

The second contribution of this chapter is to provide a discussion of side effects that possibly accompany CCTV. The chapter covers possible hypotheses and (where available) empirical evidence regarding

- various forms of displacement (chapter 3.4.1),
- a broader account of substitution effects (3.4.2, 3.4.3),
- moral hazard (3.4.4), as well as
- profiling and discrimination (3.4.5).

While some of these issues mainly reflect conventional economic and behavioral theory approaches, others are rather implied by social psychology.

3.4.1 Displacement

Various Forms of Displacement:

In the previous literature on CCTV, the side effect most dominantly discussed is the possibility that territorial (or spatial) displacement might emerges from electronically monitoring certain areas and, implicitly, not monitoring others. As Norris and Armstrong (1999, p. 92) have pointed out, "anticipatory conformity may be a strictly temporal and spatial phenomenon, with those individuals with deviant intentions shifting the time and place of their activities to outside the camera's gaze."

Crime then eventually shifts to more peripheral public and private areas not monitored (spatial, territorial or geographic *displacement*), where the negative effects arising from associated externalities may exacerbate.[122] Moreover, an adverse-selection process can crowd people with criminal intentions (unwilling to exercise social control) out of monitored areas and thereby lead to a micro-regional segregation in the social composition of the public – worsening the problem of absent surveillance in camera-free places.[123]

Although the previous literature views displacement effects almost unequivocally as negative, it need not be unintended. It is also possible, that some displacement of criminal, illegitimate or 'anti-

[121] Privacy concerns will not be in the focus of this chapter, but they are partly mentioned in section 3.5.2. For a recent discussion of privacy issues see, e.g., Cavoukian (2008).

[122] Bulos et al. (1995, p. 9) reported that the use of CCTV to revive a town center resulted in "young people being displaced by town centre improvement schemes to (…) environments which are unsafe for them such as alleyways and subways."

[123] It is also possible that displacement into gaps in coverage between cameras – but still within an essentially camera-controlled area – is possible (Gill and Spriggs 2005).

social' behavior to less centrally located areas can be politically intended. Therefore, intended and unintended displacement should be differentiated in any thorough discussion of CCTV.

Temporal displacement is also possible if cameras do not operate around the clock or if street lighting around the cameras is not sufficient at night or – in a broader sense – if CCTV reduces crime for a specific time period (short- or mid-term) but crime eventually returns to previous levels (in the long run). These effects may change the relative vulnerability of specific victim categories.

Besides territorial and temporal displacement, Reppetto (1976) also identifies 'tactical' (change in method), 'target' (change in victim), and 'functional' (change in type of crime) displacement.[124] Barr and Pease (1990) discusses positive effects or benign implications of displacement.[125]

Methodological Requirements:

The measurement of territorial displacement (as well as of territorial diffusion of benefits) requires the involvement of at least two control areas: One adjacent and one non-adjacent (but still comparable) control area. Diffusion of benefits has not been tested for in most studies (especially those covering public transport and car parks), either because these methodological requirements have not been met or simply because there is more concern about the issue of crime displacement. Moreover, it is methodologically very hard to exclude the possibility of misattribution or misinterpretation of any net crime change in adjacent control areas.

Spatial (Territorial) Displacement:

There is some (although not a large amount of) evidence considering territorial displacement of crime due to CCTV. Brown's (1995) evaluation of the schemes in the city centers of Birmingham and Newcastle-upon-Tyne show some displacement.[126] Squires' (1998) study on Ilford, England, and Mazerolle et al. (2002) on the Findlay market scheme in Cincinnati, Ohio (USA), also report displacement effects in the context of city centers.[127] Flight et al. (2003) find some displacement as well as some immediate diffusion of benefits into other areas. About the same number of studies measures little or no amount of displacement.[128]

In the context of public transport, only Burrows (1979) reports some spatial displacement, while other studies did not measure this.[129] The same observation applies to car park CCTV evaluations, where only Tilley (1993) refers to territorial displacement of vehicle crime in Hartlepool, England. Thus, Weisburd and Green's (1995) statement regarding empirical criminology in general is of special relevance for CCTV evaluations today: "(…) studies, specifically designed for measuring displacement (and the related phenomenon of diffusion) must be developed if criminologists are to make significant advances in this area" (p. 349). Furthermore, it remains open how the effectiveness

[124] From an economic point of analysis, the term 'substitution' might fit better than 'displacement' in these contexts.

[125] See, e.g. Barnes (1995), for a general discussion of crime displacement.

[126] Brown (1995) observes both territorial (regarding theft from cars) and target (vehicle theft to theft from vehicles) displacement. At the same time, there occurred a diffusion of benefits to specific control areas. Still, vehicle crime pattern changes might be more attributable to other, traffic calming measures than to CCTV.

[127] Also here, research design weaknesses such as the short data period unable to correct the apparent annual seasonality in Squires (1998) are present.

[128] See Skinns (1998), Mazerolle et al. (2002, on Cincinnati's Northside), and Williamson and McLafferty (2000).

[129] On the other hand, Webb and Laycock (1992) find some territorial diffusion of benefits in the London subway system.

of second-generation CCTV schemes influences territorial spillovers, i.e. whether the enhanced technical capabilities of CCTV increases spatial displacement and/or diffusion of deterrence benefits (Surette 2005).

Temporal Displacement:

There is also a small amount of empirical evidence for temporal displacement. For example, Webb and Laycock (1992) found that the crime-reducing effect of CCTV in London Underground stations began to weaken after about 12 months. However, the psychological mechanism underlying this finding remains unclear, as it could be due to adaption, blunting or learning effects (if potential offenders realize that the risk of apprehension has not increased). Deisman (2003) also noted that continuing publicity of CCTV is required to maintain its deterrent effects in the long run.

Functional Displacement:

There are circumstances under which a substitution in the type of crimes committed in a monitored area, i.e. a *functional displacement*, takes place – resulting from the differential effectiveness of CCTV.[130] E.g., the fact that individuals under the influence of alcohol or drugs may care less about surveillance could be a cause for CCTV being more effective in combating property crime (such as overt vandalism) and crimes of dishonesty than violent crime and public disorder (Short and Ditton 1995, 1998). Also, offenders may learn about the types of incidents that elicit a police response and the respective speed of response (Ratcliffe 2006).

Furthermore, CCTV changes the relative costs of different types of crime. Thus, it might not just stigmatize certain forms of illegitimate behavior, but also induces *secondary deviation*, i.e. behavioral changes of people willing to commit crimes. As a consequence, CCTV might be more effective against deliberate, instrumental and 'rationally' committed crimes such as car theft than against impulsive, emotionally driven offenses such as assault (Smith and Clarke 2000; Surette 2005).

A more fundamental characteristic of CCTV is the fact, that only a narrow subset of all possible forms of criminal activities can be captured by cameras (e.g. the use of physical force, malicious damage, prostitution and drug trafficking). This feature of camera surveillance eventually stigmatizes groups more prone to monitored forms of crime (mostly unemployed or low-income people), leading to secondary deviation as well as to discursive belittlement of other types of illegitimate activities (such as white-collar, organized or cyber crime) – thus, visualization and "visibility" might also influence discourse (e.g. rich kids consume cocaine in their parents' villas, while relatively poor kids smoke joints in public areas).

The 'Future of Displacement':

Regarding technological improvements such as computer-enhanced or 'intelligent' surveillance, Surette (2005) suppose that they will likely stimulate spatial displacement as computer vision systems become more effective in detecting and identifying criminals. Depending on the installed software and

[130] Williams and Johnstone (2000) identify various types of behavior that theoretically can be deterred or suppressed by CCTV: Serious crime (e.g. terrorism, violent or property crime), activities usually preceding criminal activities (e.g. disorderly confrontations), minor criminal behaviors (e.g. public order or nuisance offenses), and unpleasant but not necessarily criminal behavior (e.g. drunkenness, loitering and noise). Nevertheless, regarding the diverse evidence available at present, which types of human behavior are or are not influenced by CCTV remains an open question.

the visual recognition software, various forms of *tactical* or *target* displacement to non-recognized ways of behavior are likely to appear in the future.[131] At the same time, a less error prone 'intelligent' surveillance potentially enhances a diffusion of benefits.

Thus, evidence supporting the thesis of some territorial crime displacement is available „(…) but – as is the case with the general crime prevention literature – the amount of crime displaced rarely matches the amount of crime reduced. There is usually a net gain for crime prevention" (Ratcliffe 2006, p. 15). In fact, there is no evidence of a complete spatial displacement of all previous crimes to neighboring areas in the aftermath of a CCTV installation process.

3.4.2 An 'Arms Race'

One possible consequence of crime-shifts due to displacement is the emergence of a social dilemma triggering an *'arms race'*, i.e. over-investments in cameras and excessive use of electronic surveillance, which finally results in a supra-optimal level of surveillance (and, thus, in a negative-sum game). Tendencies of camera arms races, with cities willing to install CCTV systems simply because neighboring communities also have it, are repeatedly observed by analysts (Davies 1996; Nunn 2003). There are also politico-economic considerations on how *'slippery slope'* deployment of CCTV might be triggered. If a system of electronic surveillance such as CCTV is being installed 'marginally' (i.e. in numerous minor, slightly budget-demanding steps), this can have critical implications. From a politico-economic perspective, the general issue in decentralized security policy is the incentive structure for counter-balancing endeavors to democratically control the proliferation of remote or private security measures such as CCTV (Harel 2006). The latter may obtain public-good quality resulting in a potential lack of opposing interest group formation.

International Evidence of a 'CCTV Arms Race':

In Britain, the pioneering country considering the visual surveillance of public and semi-public spheres, CCTV has been the most heavily funded non-criminal-justice crime prevention measure (Welsh and Farrington 2003) and amounts for more than three quarters of the British Home Office's total spending on public security (Koch 1998; Reuters 2007). Particularly in the United Kingdom, there are very few binding legal restraints on the deployment of CCTV today (Surette 2005).

A quick look at the available estimates of exponentially growing CCTV coverage in the United Kingdom seems to support the suggestion of a massive arms race.[132] While from the 1970s until 1990, there were only about 100 cameras monitoring public areas in the U.K. (Norris and Armstrong 1999), this number went up to 400 in 1994, approximately 5'200 in 1997, and to over 40'000 in 500 schemes in 2002 (Armitage 2002). By the year 2007, it is estimated that approximately 4.2 million cameras are installed in the U.K., i.e. one camera per 14 citizens (The Associated Press 2007). The most recently published media reports even estimate a total number of 13 million cameras in the U.K. as of 2008 (Chivers 2008).

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[131] Edmunds et al. (1996) provide interesting evidence on tactical displacement in Australia, where drug markets could continue operation in the presence of CCTV by adapting certain operating practices. Nevertheless, dispersing drug markets was effective in two of the three areas studied.

[132] The effective growth rate of CCTV coverage seems to be remarkably higher than the 15 to 20 per cent per year Davies (1996) predicted – with the purpose to alert the public – in the mid-1990s.

This leads several observers to conjecture that the U.K. is on the verge of becoming a 'surveillance society' (Reuters 2006). Interestingly, the British Home Office had continued its vast support of CCTV schemes regardless of the inconclusiveness of empirical CCTV evaluations, some of which it financed (Cavoukian 2008). This political support has been warranted despite the fact that the technology "has developed in a piecemeal fashion with little strategic direction, control or regulation" (Gerrard et al. 2007, p. 5).

For the U.S., there currently do not exist any national estimates regarding CCTV coverage or the number of surveillance cameras installed (Welsh and Farrington 2007), though several local reports indicate an expansion of CCTV even beyond metropolitan centers at an unprecedented rate (Nieto et al. 2002, Fountain 2006).

In the last few years, several municipalities have been spending millions of Dollars for vast CCTV systems in city centers such as Chicago and Baltimore as well as in public transportation systems, e.g. in New York City and Washington D.C. (The Associated Press 2006a, b; McCarthy 2007). Welsh and Farrington (2007, p. 7) note: "(…) There are also signs that other countries, most more cautiously than the U.K. and U.S., are increasingly experimenting with CCTV to prevent crime in public spaces."

Widening of CCTV Objectives:

Another general trend in current security policy formulation is to *apply CCTV to a growing variety of social problems* beyond strict crime prevention. In the past, there was broad public and political consent that CCTV should only be used as a subsidiary measure, where conventional crime prevention instruments (such as police patrols) are either clearly less effective or not feasible to achieve law enforcement and public security objectives (Cavoukian 2008).

In today's discourse on CCTV, we observe a tendency away from that understanding: From the very beginning of CCTV application, additional political and social forces that are not directly related to crime prevention have driven a widening of its adoption and have led to the believe that it offers a viable solution to a broad range of (sub-)urban problems (Lyon 1994) and that it can increasingly be used to police public morals and order (Davies 1996). Once CCTV was introduced, the concepts of 'risk groups' and 'dangerousness' have continuously been broadened in risk management policies (Pratt 1999). Thus, according to Surette (2005, p. 154), "the spread of CCTV can be explained as part fashion and part desperations."

It is being argued that CCTV, although promoted as an instrument against serious crimes, is *de facto* more effective and also more often applied to the last two categories: Less serious crime and simply 'anti-social behavior', such as public littering, smoking, urinating, drunkenness, traffic control and parking violations (id.). There is hardly any prominent evidence for the effectiveness of CCTV in these broader domains.

Gates (2002) even termed this substitution of a specific anti-crime policy to a broader public surveillance a 'function creep', while Reeve (1998) underlines economic and social pressures originating in local business communities that lead to the expansion of CCTV coverage and scope. These factors are possibly also conducive to what is termed here as an 'arms race' in public space surveillance (see next section).

CCTV and the Media – A Vicious Circle:

There are several possible reasons for this expansion beyond any scientifically established effectiveness regarding crime reductions: In an ever-closer relationship between CCTV and visual media (television, world wide web, newspapers), a 'feedback loop' might result encouraging further growth of CCTV surveillance (Jermyn 2004). Additionally, CCTV images shown on daily television news are seen as stimulating public anxiety and elevating the perceived risk of crime, in turn, encouraging public demand for extended CCTV (Surette 2005).

Information Overflow:

The presence of an ever-growing number of cameras also incorporates a risk of not being overlookable and analyzable anymore. Such an information overload can occur either if the proportion of screens that can be watched live and simultaneously drops at a rapid pace (Patel 1994) or if the amount of data becomes to large to save for an adequate time span. While the first problem primarily undermines the ex ante deterrence function, the second aspect also erodes the *ex post* detection and evidence function of CCTV images.

On the other hand, there is also a constraint regarding the number of monitors that can reasonably be watched by a single person: Usually, it is proposed that no more than two screens should be simultaneously watched per control room employee (Brown 1995; Surette 2005). In any case, the issue of boredom is also closely related to data swamping and can lead to insufficient processing of the available visual information.[133] Norris and Armstrong (1999) conclude that while many CCTV systems are monitored only part-time, some are not being monitored at all. Furthermore, depending on contractual details and mandates, these operating practices could also have serious legal implications.

Behavioral Adaption and Learning:

From a behavioral perspective, the pure fact that CCTV seems to become a practically omnipresent phenomenon – the average U.K. citizen is being caught on camera approximately 300 times a day already (The Associated Press 2007) – might have considerable long-term implications as well: *Adaption and habituation* eventually undermine any former effectiveness of locally bounded CCTV systems. Or, alternatively, criminal infringements may shift spatially to private spheres. Such consequences of the CCTV arms race are only beginning to be analyzable in the next few years.

3.4.3 Statistical Recording Effects

The presence of CCTV enables another way of *recording crime* by the police and may also encourage reporting by the public to the related supervisors or officers (Welsh and Farrington 2003, 2007, Surette 2005). Especially offences with low reporting rates such as graffiti and minor drug offenses can be spotted better, even if actual crime remains constant or decreases.[134] This statistical effect can cause registered crime numbers to increase and blurs the actual causal relation. To discern this statistical

[133] Aggravating the risk of inattention by monitoring people is the fact that, the more cameras are operative, the higher the proportion of uneventful, quiet scenes (given that CCTV systems are typically installed in sensitive and heavily frequented areas first).

[134] Winge and Knutsson (2003) show this effect regarding narcotics offenses in a study evaluating CCTV at Oslo Central Railway Station.

effect from actual deterrence, a separate measure for crimes detected *exclusively* thanks to CCTV would be helpful.

In an approach to deal with recording effects of CCTV, Sivarajasingam et al. (2003) focus on the nexus between recorded violent offenses and assault-related emergency room visits across five British towns (using five additional cities as control areas). They find that although recorded violence did increase, emergency room attendances decreased significantly, suggesting that CCTV stimulates police detection and early intervention reducing the probability of an escalation of violence.

3.4.4 Moral Hazard Problems

In the context of video camera surveillance, modern social psychology and behavioral sciences offer several hypotheses about side-effects beyond the traditional economic substitution effects:

Negative Incentives for Taking Private Self-Prevention Measures:
CCTV could give individuals a biased sense of security and thereby make potential victims more vulnerable if they relax their vigilance or stop taking certain precautions. If individuals neglect or *under-invest in possible private prevention* measures in the presence of CCTV – inducing lower subjective alertness, verbally provocative or abusive behavior and, finally, a higher risk of victimization – a moral hazard problem arises and prevention costs are being externalized. This incentive problem can materialize, e.g., in people wearing more expensive jewelry or not walking in groups when out at night (Welsh and Farrington 2003, 2007).

Intensifying the moral hazard problem, in the long run, individual behavior may also adapts to the ever more evident presence of surveillance, creating an 'illusion of safety',[135] and further reducing (private) prevention efforts. Although the possibility of reduced willingness to take precautions is mentioned in some of the existing literature (e.g. Welsh and Farrington 2003, 2007), it has not been empirically analyzed so far – also because of data and measurement difficulties.

Avoidance Behavior:
Females are much more likely to avoid specific urban areas at certain times (especially after dark) than males and this sort of avoidance behavior is positively correlated with age (Ditton 2000). However, these study results do not establish whether fear of crime is causally driving avoidance of older women. Paradoxically, there were no improvements in avoidance behavior in experimental areas relative to control areas after the installation of CCTV in city centers, i.e. the places under surveillance were not frequented more often (id.).

Nevertheless, it remains to be seen whether further research confirms these early findings on such subtle behavioral adaptations. A moral hazard issue possibly also appears when looking at avoidance behavior, because avoidance of certain areas can be interpreted as a measure of self-protection that might be crowded-out if CCTV is perceived as being an effective security-providing tool.

[135] See also the following subsection 3.4.5 on subjective security and CCTV, which is closely related to the moral hazard questions touched upon here.

Crowding-out of Social Surveillance:

Apart from undermining private (self-)prevention incentives, a *crowding-out of social control* can come into appearance, diminishing moral courage, undermining social cohesion or even aggravating tendencies of individuation. Ultimately, the 'electronic eye on the street' (Fyfe and Bannister 1998) might corrode informal guardianship in public spaces, which was coined as 'spontaneous' or 'natural surveillance' by Jacobs (1961).[136]

Graham et al. (1998, p. 25) also speculate that "by encouraging people to have faith in some disembodied electronic eye, CCTV may actually undermine the natural surveillance in towns and communities (…) the result may be a further spiral of social fragmentation and atomization, which leads to more alienation and even more crime."[137] Alternatively, Ratcliffe (2006, p. 11) considers that, if citizens see overt cameras being installed in their neighborhood, this might label the area as high-crime (negative signaling) and thereby possibly accelerates the process of social disorganization."

According to many scholars, the deployment of CCTV, the privatization of public space, increased mobility as well as the segregation of residential, retail and business areas hamper informal networks and processes of voluntary control (Norris and Armstrong 1999, McCahill and Norris 2002). The destabilization of traditional communities and the fluctuation in social networks contributed to a decline in information about neighbors and acquaintances (Young 1999). Wilson and Sutton (2004) also suggest, for the context of Australia, that CCTV has the potential to exacerbate social division and exclusion.

Alternatively, extensive CCTV coverage may also have the potential to "encourage broader based public interactions between classes, races, and ages by increasing a shared sense of safety" (Surette 2005, p.165) and thereby stimulate social guardianship. Still, there is only very scarce empirical advance in analyzing these social consequences of electronic surveillance techniques and thus no reliable conclusions to be drawn so far. Surette's (2006) study suggests that the installation of CCTV does not degrade informal citizen guardianship.

3.4.5 Profiling and Discrimination

Security camera footage examination has necessarily a selective nature. Accordingly, there is a certain extent of *discretion* remaining to control room operators and judges, if monitoring of people is comprehensive. Therefore, who controls CCTV generated content is a central issue regarding the system's acceptance (Surette 2005). Especially in the absence of formalized imperatives and specific guidelines, "there is a higher likelihood of profiling, stereotyping and discrimination."

Williams and Johnstone (2000) observe systematic, selective racial and socio-economic *profiling* by CCTV system operators who aim cameras at social groups they subjectively judge as high-risk or more likely to behave defiantly, especially young black males. Discriminatory CCTV monitoring and a tendency towards racial and ethnic profiling in evidence gathering and law

[136] The loss of informal social guardianship previously conducted by residents of shared public spaces is also a key concept in routine activities theories of crime (Cohen and Felson 1979). Cohen (1985, p. 127) argued that there is a "master shift about to take place (…) towards the control of whole groups, populations and environments – not community control, but the control of communities."

[137] Landry and Bianchini (1995, p. 7) conjecture that "this is the case in many indoor shopping malls, executive housing developments and even some affluent residential streets, where (…) technology is becoming a substitute for people and the natural surveillance that comes from human interaction."

enforcement were also observed by Ditton (1999), Norris and Armstrong (1999), and Norris (2001). Norris and Armstrong (1999, p. 83), e.g., found that CCTV images "become another resource to be selectively utilised by the police in pursuit of their own organizational goals which are not coincidental with the full enforcement of the law."

While social (potentially 'discriminatory') monitoring based on categorical criteria such as race, age, clothing or subculture membership determines one third, behavioral based surveillance only determines about a fourth of the surveillance targets (Norris and Armstrong 1999; Goold 2004). Ditton (2000) found that control room operators adopt police categories of suspicion when viewing the CCTV screens. It remains to be analyzed in how far the publicity of selective surveillance practices may influence public attitudes towards CCTV differently for specific socio-demographic groups.

Associated with the issue of profiling, CCTV operators have also been accused of abusing the system and training surveillance cameras on not crime-relevant spots such as windows, young female pedestrians, etc. (Surette 1985, 2005; Rosen 2004). *Voyeurism* potentially increases the risk of missing criminal behavior and events and thereby reduces CCTV's effectiveness. However, Norris and Armstrong (1999) have neither found extensive voyeuristic use, nor does profiling – although not uncommon – entirely dominate CCTV operation.

According to Borg (2004), there are several reasons why second generation digitalized CCTV might *formalize the monitoring process* and thereby eases the risk of social profiling: Standardization and centralization of the information gathering process; non-partisanship increasing the social distance between watchers and watched; and the sheer increase in the quantity of monitoring. On the other hand, the enhanced technological capabilities of 'intelligent' CCTV will unlikely mitigate common concerns about intrusiveness of surveillance and privacy rights (Surette 2005).

Interest Group Analysis:

Another politico-economic aspect not considered in-depth here is the *process of policy formation* regarding CCTV. A complex and dense network of actors and stakeholders are involved in this process including players in the sphere of politics (local authorities), law enforcement (police, army), the 'public' (media, civil liberties organizations, schools, hospitals, voters), and private economic actors (private security companies, insurance companies, suppliers of CCTV equipment, retailers, real estate proprietors, and other special interest groups).

A politico-economic model has not yet been developed to profoundly understand the regulation, adoption and diffusion of CCTV. Any such model would definitely take into account those various interest groups, the relevant institutional contexts as well as possible consequences of specific institutional arrangements (e.g. slippery-slope considerations).

3.5 Subjective Valuations of CCTV as a Crime Prevention Measure

Here, empirical evidence on subjective valuations of security as well as public acceptance of CCTV surveillance and voting on CCTV are discussed. Situational crime preventions such as CCTV can influence individual feelings of security and fear in either direction.

3.5.1 CCTV and Subjective Security

Subjective feelings of security have fundamental implications for economic and political decision making processes. If individuals feel more secure in public areas they may perceive this as an enhancement of their liberty of action. If perception changes in that direction, various behavioral consequences are possible: People might adapt their behavior, e.g., by eating out or using public transportation more frequent, in a broader range of areas and later at night. These considerations might also be relevant in the context of CCTV.[138]

Evidence:

The net effect of video camera surveillance on the *subjectively perceived level of security* (fear of crime) and thus on subjective well-being is ambiguous *ex ante*, because cameras either relieve or incite fear of crime, the latter by sensitizing individuals to potential endangerment.[139] Phillips (1999), e.g., finds mixed and inconclusive results regarding the effect of CCTV on fear of crime, while Sarno et al. (1999) suggest that 60 per cent of the public surveyed, who knew about the presence of the cameras, felt safer after the introduction of CCTV. In Flight et al.'s (2003) study, subjective security improves (slightly) in only one of three areas covered. Deisman (2003, p. 3) subsumes somewhat vaguely that "CCTV generally increases feelings of safety and that it also reduces fear of victimization."

Generally, crime prevention survey respondents *ex ante* claim that they would feel safer if a specific measure is implemented, but *ex post* these expectations of improved feelings of personal security usually do not materialize once the measure is in place. This effect is shown, e.g., in Nair et al. (1999) summarizing studies on street lighting and in Skinns' (1997, 1998) evaluation of CCTV in Doncaster – although actual crime is in fact reduced according to the respective studies.

While the majority of people generally knows about the presence of cameras, especially in small residential areas, this awareness does not necessarily lead to a reinforced feeling of security (Gill and Spriggs 2005): In just two of 13 evaluated CCTV-areas, worry about being a victim of crime declined significantly more than in a control area, whereas the increase in feelings of safety was not significantly larger in any of the targets region. Furthermore, the worry about being a victim of crime seems to be directly related to actual crime levels, rather than the mere presence of CCTV (id.).

In contrast to the residential areas studied by Gill and Spriggs (2005), there is conflicting evidence also on the visibility of installed CCTV surveillance schemes in larger urban areas. In Glasgow, e.g., only a third of the passers-by in the city center realized CCTV three months after its

[138] Deisman (2003, p. 22) argues: „The connection between objective states of security and safety and subjective feelings of safety and security needs to be explored in the context of CCTV."

[139] A more sociologically oriented literature argues that CCTV strategies are aggravating the insecurity and fear already brought about by wider processes of 'deregulation' and 'privatization' (e.g. Bauman 1997; McCahill and Norris 2002).

installation and only 41 per cent of respondents are aware of it another twelve months later (Ditton 2000). These percentages are in line with earlier analyses by Honess and Charman (1992) and Horne (1996). In general, fewer women than men and fewer old than young people are aware of CCTV.

According to Ditton (2000), men generally feel safer than women, younger people (16-34 years, both sexes) feel less safe than older people of the same sex, and people surveyed in the city center revealed a significantly lower subjective security – both before and after the installation of cameras. Concrete victimization worry is significantly higher at nighttime which might also explain why the young (being in the city at night more often) exhibit more concern.[140] Thus, surveys have shown little evidence that CCTV has positively affected subjective security or the 'fear of crime'.

Another common finding regarding public attitudes is that, although only slightly more than 50 per cent of respondents think that CCTV makes people feel safer, a substantial majority thinks that CCTV is effective at preventing crime and disorder, and around three quarters think that it is effective at detecting crime and catching those responsible (Ditton 2000; Honess and Charman 1992). When comparing technical and human situational crime prevention measures, Ditton (2000) let people compare one extra police officer with five CCTV cameras:[141] Although people consider the two measures nearly equally effective (at preventing crime), a majority of 53 per cent prefer an officer over CCTV with regards to their subjective feeling of security. In another survey item, the presence of an additional police officer is seen twice as effective at raising subjective security, but three times less effective than a CCTV system at actually detecting crime.

Interestingly, in their qualitative survey in the Geneva public transportation system, Ruegg et al. (2006) find that even employees controlling tickets have ambiguous opinions regarding CCTV. On the one hand, cameras raise their subjective security, but on the other hand, they also feel some pressure resulting from the possibility of being permanently observed and controlled at work.

Further Psychological Considerations:

Being 'on camera' might also create *procedural disutility* if individuals feel some kind of conformal pressure in view of electronic surveillance. There is some evidence on negative public perceptions of CCTV – in the sense of a 'spying big brother' (Honess and Charman 1992). Although, unintentionally increased suspicion or fear of crime is a possible consequence, the public seems to be "strongly in favor" (Ratcliffe 2006, p. 16) of accurately operated CCTV.

Related to the preceding argument of procedural disutility, restrictions of personal autonomy or impositions of social pressure potentially activate *psychological reactance* (Brehm 1966) and thereby stimulate instead of deter defiant behavior (such as indecency, littering, or even overt vandalism) of monitored people. When individuals become aware of the fact that they are being monitored, "this may have a chilling effect on their freedom to speak, act and associate with others" (Cavoukian 2008, p. 2) and CCTV will probably be perceived as an extrinsic means of enforcing social conformity.

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[140] Surprisingly, the same study by Ditton (2000) finds that people who claimed to have been victims before are not more likely to feel insecure than non-victims.

[141] Empirically, the respective financial costs are more or less the same, although 58 per cent of the sample thought the five cameras would be cheaper and the other 42 per cent believed they were more expensive. Thus, many people underestimate the costs involved with camera surveillance systems.

This might incite intrinsic resistance and aggression, if people feel a pressure to adjust or censor their own behavior. Though this possible consequence of being under surveillance has not been studied explicitly, there is sporadic evidence pointing at reactant behavior: In 2004, e.g., an expensive CCTV mast with several cameras has been torn down and burnt by vandals on a South Wales estate (British Broadcasting Corporation 2004).

3.5.2 Public Attitudes Towards CCTV and Voting Behavior

There is only scattered evidence regarding public attitudes towards CCTV.[142] A frequently cited but probably unrepresentative opinion poll, conducted in April 1993 in Glasgow by the newspaper 'The Independent', implied that (a) almost 90 per cent of people support public surveillance projects and (b) less than 10 per cent perceiving CCTV as an infringement upon their privacy (Ditton 2000). Further research for the same area showed that, although there is a majority in favor of CCTV, it is supported only by around two-thirds instead of 90 per cent of the public (id.).[143]

On the other hand, around one third of the public in the United Kingdom criticizes CCTV as invasive regarding civil liberties: Empirical research shows that between 29 and 36 per cent of the people report anti-CCTV attitudes – and even the 67 per cent of respondents who judge CCTV 'acceptable' might be overestimated, because several fear inducing and thereby 'pro-CCTV' questions preceded the attitude questions (Honess and Charman 1992; Squires and Measor 1996; Bennet and Gelsthorpe 1996; Gill et al. 2007).

Recently, Gill and Spriggs (2005) studied this issue in a broad analysis of 13 CCTV projects in the United Kingdom. They suggest that public support for CCTV is very high before and during the installation of CCTV and although it declines over time, it remains quite high even months or years after CCTV has become operative.[144] Still, the slight decline in support as well as the (ex post) unchanged behavior following the installation of CCTV suggests that „(…) the idea of CCTV was far more appealing in theory than it proved in practice" (Gill and Spriggs 2005, p. 55). This phenomenon especially seems to apply for CCTV in residential areas, where Gill et al. (2007) reported that changes in the experienced victimization is much more important for perceptions of safety than the introduction of CCTV.

There is also some empirical support for the notion that people in urban areas prefer 'natural' to 'electronic' surveillance (Ditton 2000): On the one hand, a majority thinks that CCTV has a lot of potential at detecting crime, but on the other hand, police patrolling is seen to be more effective in enhancing subjective security. Public acceptability of CCTV seems to be higher in areas that are obviously private property of others (such as shops, banks or car parks) where they have been accustomed to surveillance and where the intentions underlying CCTV are obvious.

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[142] In contrast, there is a substantial literature discussing privacy and legitimacy issues at length. For example, several studies and reviews point to the dominance of Orwellian paradigms in CCTV studies (see, e.g., Grass 2004, Williams and Johnstone 2000, Lyon 1994). Coleman (2004) stresses the over-representation of approaches using Foucault's metaphor of the 'Panopticon' in attempts to understand the deployment of CCTV reinforcing a diffusion of societal control. For reviews of these analytical currents, see the special issue of 'Surveillance and Society' on "Foucault and Panopticism Revisited" (Wood 2003) as well as Fussey (2007).

[143] Acceptance of CCTV rises with age, is higher for women and for people living outside of the urban area.

[144] Gill and Spriggs (2005) suggest a robust proportion of 69 to 96 per cent of respondents being 'happy' or 'very happy' about the presence of CCTV over their evaluation period.

In contrast, around one third of people 'mind'[145] being under the surveillance of CCTV-cameras on public streets – compared to only 14 per cent minding CCTV in car parks (Ditton 2000). Civil liberty concerns are inversely related to age, are more often expressed by males and also by people who reported to have been victims of crime, especially violent crime and repeat victims – the latter finding, although perhaps surprising and not easily explicable, is supported by two surveys (Squires and Measor 1996; Ditton 2000). While people usually do not believe that CCTV allows a reduction in police personnel, 70 per cent of the respondents think that it helps to exculpate innocent people from being wrongly accused.

Accordingly, concerns regarding implications of CCTV for privacy and civil liberties seem to be small from the beginning and even slightly weaken after the installation of the cameras: Only two to seven per cent consider cameras to be intrusive after they had been installed – less than before the installation period, when it was 12 to 19 per cent of the respondents (Gill and Spriggs 2005). Therefore, concerns over civil liberties do not explain the (small) reduction in support of CCTV over time. Rather, this decline in support goes hand in hand with people's perception about the CCTV's limited effectiveness, reflected in low proportions of the population stating that 'with CCTV, the level of crime has got lower' (id.).

Additionally, there is scattered evidence that there are certain differences in public support for CCTV application between countries (Welsh and Farrington 2007). These differences, which might originate in specific cultural contexts or historical experiences with state interventions and surveillance, possibly influence the way CCTV is perceived by potential offenders and victims and thus its relative effectiveness. While in the U.K., there generally has been a strong public support of CCTV in public space (Norris and Armstrong 1999, Phillips 1999, Ditton 2000), the respective level of acceptance in the U.S. seems to be lower due to wide-ranging privacy concerns (Murphy 2002).

There are significant differences between regulatory requirements and public funding of CCTV initiatives: While CCTV is heavily funded and spreads more or less unimpeded by democratic legal restrictions in the U.K. (Welsh and Farrington 2007), political support seems to be lower and regulation of CCTV in public spaces substantially higher, e.g., in Scandinavian countries such as Sweden or Norway (Blixt 2003, Winge and Knutsson 2003). Thus, lacking public or political support and funding as well as corresponding media coverage might also have an impact upon the effectiveness of CCTV and the scientific rigor with which it can be evaluated.[146]

In a representative survey, CCTV-related attitudes of 2'400 people living in the urban area of Zurich, Switzerland, have been assessed.[147] These individuals have been asked two questions on subjective valuations of CCTV:

(a) "According to you, how much does CCTV increase security?" Answers could be made on a scale from 1 to 4, 1 meaning "very little" and 4 "very strongly".

[145] Ditton (2000, p. 701) notes, that "it should also be realized that to 'mind' is perhaps a curious term, which may mean different things to different people. To mind, however is not necessarily to object to, or to oppose."

[146] Welsh and Farrington (2007) note that the average follow-up period of the non-U.K. evaluations was considerably lower (9.6 months) than the one observed in the U.K. evaluations (16 months). Still, this might be due to the bare fact that CCTV is still in its beginnings in most countries compared to the prolonged British experiences with the technique.

[147] This is the same survey as described in chapter 2, section 2.5.

(b) "In how far do you perceive your personal liberty restricted by the presence of CCTV?" Answers could again be made on a scale from 1 to 4, 1 meaning "very little restricted" and 4 "very strongly restricted".

Table 18: Attitudes Towards CCTV in Zurich, Switzerland

CCTV perceived as...	**'Security-Enhancing'**		**'Liberty-Restricting'**	
	(I)	**(II)**	**(IV)**	**(V)**
Aggregate Measures:				
Vict. Risk Violence	-0.531	-0.011	0.607*	0.245
	-1.80	-0.04	2.10	0.68
Vict. Risk Property	-0.206	-0.431	-0.097	0.488
	-1.19	-1.54	-0.56	1.81
Individual Experience:				
Victimization Violence	0.047	0.044	-0.011	-0.017
	0.92	0.76	-0.25	-0.29
Victimization Property	0.032	0.038	0.036	0.022
	0.79	1.02	1.53	0.70
Male	-0.219	-0.374	0.004	0.125
	-1.06	-1.86	0.02	0.47
Age	0.005	0.004	-0.023**	-0.025***
	0.61	0.47	-3.04	-3.64
Aggregate Perceptions:				
Graffiti	0.127	0.206	0.600***	0.281
	1.21	1.10	4.81	1.66
Littering	-0.280*	-0.107	0.026	0.045
	-2.07	-0.43	0.13	0.18
Dubious People	1.014***	0.942*	-0.938*	-0.633
	3.69	2.45	-2.14	-1.40
Run-Down Houses	0.220	-0.592*	0.015	0.621
	0.80	-2.47	0.04	1.22
Nightclubs	-0.610***	-0.352	0.302	0.126
	-4.86	-1.73	1.41	0.50
Aggregate Perceptions:				
Police Presence	0.010	-0.299	0.020	0.063
	0.07	-1.20	0.10	0.27
Individual Characteristics		Included		
Constant	2.718***	2.859***	2.645***	2.566***
	12.92	12.70	11.19	12.20
N	2271	2271	2322	2322
R squared	0.0246	0.0278	0.1245	0.1260

Notes: Individual Characteristics include: Age x Male, (Age^2)/100 x Male, Education, Occupation, Income, Foreigner, Lives in Appartment, Single Person Household.
In columns (I) and (III), victimization risk, signal and police perception is aggregated by district; in columns (II) and (IV) by neighborhood.
Partial correlates from OLS regressions; coefficients above t-statistics.
Significance levels: *.05<p<.01, **.001<p<.01, ***p<.001.
Source: Own calculations based on Zurich Crime Survey (2006 wave).

The results from the multiple regression analysis are presented in Table 18. The analysis reveals that there are no statistically significant differences in the perception of CCTV effectiveness (question 1) and intrusiveness (question 2) between men and women (when controlling for a variety of other socio-demographic factors). Older people do not feel more secure due to CCTV. However, they perceive cameras as less intrusive than young respondents. Respondents with a higher income feel more secure and less restrained in face of CCTV.

Individuals facing a higher 'risk of violent crime victimization' (measured the same way as described in section 2.5) expect *less* of an increase in security and feel *more* restricted personally by CCTV. In contrast, individual victimization experiences do not seem to matter with regards to CCTV attitudes. Finally, those living in districts or neighborhoods with a high average visibility of 'dubious people', perceive CCTV as security-enhancing and less restrictive than people living in areas where this signal of disorder is less prominently visible.

3.5.3 Voting on CCTV

Institutions of direct democracy offer unique evidence on citizens' support of the application of CCTV.[148] By a referendum, people can enforce a popular vote on the deployment of CCTV, which, in turn, result in binding decisions.[149] In Switzerland, three referenda have taken place at the municipal level so far. The public votes were preceded by a broad public debate in local newspapers and communities.

The citizens of *St. Gallen* were the first to vote on a CCTV scheme including 21 cameras in the city center (passively monitored) and 15 cameras around the soccer stadium (monitored in real time) in November 2007 (Neue Zuercher Zeitung 2007). A referendum supported by the youth sections of left parties forced a public vote on the issue: 63.3 per cent of the voters agreed to the CCTV project costing around 2.5 million Swiss Francs.

A referendum was also successfully launched against CCTV plans for the city center of *Lucerne*, Switzerland. A public vote resulted in 69.9 per cent of the citizens approving a legal basis for CCTV in public spaces, which are not territorially delimited (Neue Zuercher Zeitung 2008). Participation on June 1, 2008 was slightly above 50 per cent of the population eligible to vote. This voting result empowered the local executive authorities to instantly initiate the installation of CCTV on the railway station square and on two centrally located historic bridges (total costs of around 350'000 Swiss Francs). Further possible locations (such as other neuralgic squares and the soccer stadium area) are discussed. All cameras need to be clearly indicated by information signs.

An interesting contrast appears when this voting result is compared to an earlier survey, conducted in Lucerne in August 2006: At that time, only 48 per cent of the people covered by the representative survey judged CCTV appropriate to raise *subjective security* in Lucerne (Stadt Luzern 2006). It remains open, in how far the higher approval rate in the vote reflects beliefs regarding the effectiveness of CCTV as a crime prevention tool.

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[148] For an analysis of collective decision-making in direct democracies see, e.g., Frey and Stutzer (2006b).

[149] By transforming public into private decisions, processes of public political discourse – stimulated, e.g., by the option to launch referendum – can be helpful in the provision of public goods (Bohnet and Frey 1994).

In late September 2008, another popular vote on CCTV took place in the city of Schaffhausen near the German-Swiss border (News.ch 2008). There, 60.6 per cent of the voting population (participation rate of 56.2 per cent) approved the selective application of CCTV in 'hot spot' areas.

Interestingly, in all cities, the opposition as well as the initiation of the referenda have been aroused mostly outside of established political parties. In Lucerne, e.g. a new interest group – spanning young, politically left-wing oriented people as well as labor union members – formed. They attempted to make effectiveness as well as privacy issues involved with the planned CCTV project publicly salient.[150]

Thus, previous public votes conducted in Switzerland seem to support the findings reported in Gill et al. (2007), who conclude that in western European (and, especially, U.K.) countries, roughly two thirds of the public is in favor of CCTV – at least, before it is installed. More public votes on local CCTV schemes are sure to come in the near future.

[150] For further information, see http://www.keinekameras.ch.

CHAPTER 4

Conclusions

4.1 Fear of Crime Signs of Public Disorder, and Victimization Risk

Human beings commonly would like to feel secure and avoid fear of crime. Whether people feel secure or insecure plays a crucial role for individual well-being as well as for public policy. At the same time, fear is also a useful sentiment, acting as a natural or inborn defense mechanism in specific situations and for certain people. As perceptions of security and insecurity are pivotal determinants of security demand, they can induce significant expenditure for security and insurance.

There is a widespread understanding that subjective security and objective risks (measured by official crime statistics) do not overlap perfectly and are often statistically weakly related. Subjective perceptions of the crime problem might be a result of how people make sense of their environment and community in a broader sense. One main objective of the study was to explore the role of public disorder in subjective public security as it lies at the core of prominent theories on crime prevention.

Conceptually, the work outlined here relates and adds to recent literature on fear in economics and offers a link to the rapidly expanding corresponding literature in criminology. Fear of crime is a multidimensional concept that involves cognitive as well as affective components. Two aspects of public security that both matter to individuals are differentiated: 'Objective' and 'subjective' security. The most frequently used instruments to elicit fear of crime are subjective measures, e.g. implemented in surveys.

Novel empirical evidence presented in this study challenges and enriches the framework of public security policy. This analysis is based on data for the city of Zurich, Switzerland (the Zurich Crime Survey). In international comparison, Zurich is a 'low-crime' urban area: It has been named the city with the second-to-highest level of 'personal safety' and highest living standard worldwide. The high quality survey data, totaling 7'200 observations, simultaneously includes information on reported fear of crime, individual victimization, police presence, and individually observed signals of disorder or incivility.

From a rational choice perspective, people are expected to be more fearful of crime if their (statistical) risk of victimization is relatively high. The evidence from Zurich suggests that there might be only a weak (if any) link between the victimization risk and subjective feelings of insecurity and fear. Simple correlation analysis of regionally aggregated measures results in a positive relation between fear of violent crime and risk. However, a negative relation between fear of property crime and risk is observed. When controlling for socio-demographic characteristics in multiple regression models, there does not seem to be a (partial) correlation between fear of crime and victimization risk with regards to both types of crime.

In addition, the Vulnerability Thesis suggests that women and older people feel themselves to be less capable of defending against criminal infringements and, consequently, are more fearful than men and adolescents, respectively. Controlling for victimization risks and other individual

characteristics, men actually do express significantly less fear of crime. This holds for both crime types, however, the gender difference is three times larger regarding violent (vs. property) crime.

With regards to the second relevant vulnerability indicator, a person's age, the Zurich Crime Survey data suggests invertedly u-shaped fear-curves, with maxima at around 42 years of age for fear of property, 39 years of age for men's fear of violence. Women's fear of violent crime is deceasing across the surveyed sample. Thus, fear of violent crime seems to be more virulent for younger people.

Alternatively, according to the Incivilities Hypothesis, visible cues for the capability of a community to control crime, i.e. signals of public disorder as well as police presence, may matter for individual judgments about public security. This argument underlies the Broken Windows or Zero Tolerance approach frequently implemented in modern policing. Keeping the victimization risk constant, no significant partial correlation between the average presence of any type of disorder and fear can be observed, except for the presence of dubious people.

Thus, 'social' disorder – of which the dubious people loitering around are the most prominently described form – seems to be more relevant for the fear of crime than 'physical' disorder. Even though social disorder is a relevant covariate of people's fear of crime, it might be a poor signal for risk. 'Dubious people' and all other aggregated measures of disorder are not robustly related with victimization risk.

However, including subjective perceptions of neighborhood disorder renders the previously significant partial correlation between the average presence of 'dubious people' and fear of crime insignificant. Thus, some part of the coefficient of the aggregately measured visibility of 'dubious people might be attributable to subjective valuations. All subjectively perceived types of disorder (except 'nightclubs') correlate positively and statistically significantly with fear of crime. To some degree, this might reflect unobserved third variables.

Analogously, individuals may interpret formal ways of (social) control such as visible policing as signals for social order. Thus, a higher visibility of police patrols in a neighborhood – an essential form of community-oriented policing strategies – is expected to lower local residents' fear of crime. The partial correlation between aggregate police presence and fear of crime depends to some degree on the model specification. According to the preferred model specification, i.e. controlling for year fixed effects, average visibility of police seems to lower fear of crime. Including subjective police perceptions does not alter these findings essentially.

The Victimization Hypothesis states that individuals with previous victimization experiences are more fearful of crime than people without personal victimization experiences. The Zurich Crime Survey data clearly shows positive partial correlations between individual victimization experiences and fear of crime with regards to the corresponding crime type. Thus, fear of crime is driven by one's own past victimization experiences.

Moreover, the fear of property crime is relatively higher for people who have been violently victimized. However, the fear of violent crime does not seem to be affected by property crime victimization experiences. Aggregate victimization risk is still not statistically significantly correlated with fear of crime when controlling for individual victimization experiences.

While research on the fear of crime has become a prominently discussed policy issue, there are several methodological as well as content-related aspects deserving further empirical investigation. Technically, identification and measurement issues, as well as additional data requirements indicate possible directions for future research in the field. In the following, four *methodological* and two *content-related* aspects are summarized.

First, a vital methodological issue when trying to identify partial correlations and 'effects' of victimization risks, disorder, and the like on the fear of crime, is the *spatial segregation* used in the empirical analysis. Any non-experimental field study analyzing spatially segregated geographical units (such as neighborhoods) faces the potential problem of people self-selecting into certain living or working environments. Mobility and financial resources are thus relevant factors when studying potential selection biases, although these problems may only be seriously controlled in (quasi-) experimental situations, e.g., when people are 'randomly' attributed to certain areas of residence in the framework of social welfare or other public housing programs.

Second, the common observation of commuting implies that a certain part of everyday life is spent in areas outside of one's residence neighborhood. Possibly, the victimization risk in neighboring districts or neighborhoods as well as in the area of a respondent's working place should also be taken into account when empirically analyzing fear of crime, victimization, and disorder.

Third, an omitted variable bias might be a problem. It is possible that fears not directly related to crime are still being expressed as crime-related fears. One way to address this in future research is to include additional measures, e.g. observatory measures (physiological etc.) or more complex survey items, besides the reported survey-measures. An alternative to elicit information about crime and public concerns would be a systematic analysis of police call records. However, measurement issues also arise when defining and 'quantifying' signs of disorder and incivilities by 'objective' means. Another aspect often not explicitly accounted for is health status. Health might be a crucial factor with regards to an individual's vulnerability and, therefore, observational measures of personal health would be helpful in further testing the vulnerability hypothesis.

Fourth, another methodologically relevant issue results from the possibility, that fear of crime and risk perceptions are embedded in a social context and, therefore, result not only from personally experienced but also from socially transmitted interpretations of community. Indirect victimization experiences (through family members, friends, colleagues, or the mass media) may influence the perception of victimization risks and fear of crime. Future research could take into account the multiple transmission mechanisms through which representations and beliefs about victimization risks translate, while comparing different institutional contexts.

The second set of interesting issues to put on the research agenda focuses on content-related extensions. First, the relationship and potential causality between risk and fear of crime is affected by individuals' behavior in accordance to their beliefs. For example, people can proactively take preventative action and security measures. A high level of fear may act as a catalyst in the (private) adoption of security measures in order to reduce the likelihood of victimization. From an equilibrium perspective, these behavioral actions can, in turn, feed back upon fear-related beliefs. Thus, private

crime prevention is an interesting and relevant extension in an analysis of the processes surrounding the fear of crime.

A second content-related aspect relevant for upcoming research efforts is the consideration of potential consequences for public security policy. The strong association between an individual's personal previous victimization experience and her fear of crime suggests that actual crime reductions also reduce the fear of crime problem (but not via a change in the generally perceived victimization risk). Furthermore, the relative burden of fear with regards to specific crime types as well as the relative importance of specific types of disorder may contribute to the design of policing strategies and broader public security policies. In this context, individual utility and aggregate welfare considerations in the face of fear of crime are fundamental issues.

4.2 Previous Evidence on CCTV Effectiveness

The existing evidence regarding CCTV as a situational crime prevention measure is mixed, to say the least. While Welsh and Farrington (2007, p. 49) summarize that their "previous work (…) has generally shown that situational crime prevention generally is an economically efficient strategy", this finding is not directly applicable to the empirical study of CCTV effectiveness.

Interestingly, most studies showing a desirable effect of CCTV on criminal activity (i) were carried out in the United Kingdom and (ii) concentrated on camera surveillance in the context of car parks. Moreover, the vast majority of existing CCTV evaluations originate from the U.K. Almost all studies from other geographic areas (such as the U.S. or Scandinavia) do not provide evidence of moderating effects on crime.

The *empirical key findings* regarding the effect of CCTV on crime can be summarized as follows:

First, the effect of CCTV heavily depends upon the *type of crime* considered:[151] By affecting the expected costs of criminal behavior, this type of electronic visual surveillance seems to be more effective at combating planned or premeditated criminal behavior such as property offences than emotionally driven, impulsive violence. Thus, it is suggested that CCTV is most effective in reducing property crime (such as car crime and, a bit more ambiguously, burglary, simple theft, criminal damage, shoplifting, and arson) but the findings in regard to crimes involving people (assault, robbery, and drug offences) are contradictory. This might explain why CCTV seems to work a lot better in car parks than on public squares and in broad mass transit systems.

Second, the *local context* in which CCTV is operating is crucial for its effectiveness. While crime appears to be manageable (to some extent) by CCTV in small, enclosed or at least well-defined areas with limited and controlled access points (such as parking lots and car parks), there is hardly any significant evidence regarding highly frequented public spaces with open access (such as 'hot spots' in city centers). Interestingly, the latter areas are exactly the ones where the application of CCTV is currently spreading most rapidly. E.g., the evaluations assessing the impact of camera surveillance on crime in public transportation systems (only four dated studies meeting scientific criteria) present conflicting evidence of effectiveness: Two studies showed a desirable effect (though camera surveillance was paralleled with other interventions in both cases), one had no effect, and one evaluation even showed an undesirable effect on crime). In most contexts in which it has been implemented so far, CCTV is at least unlikely to aggravate the problem of crime.

Third, the way CCTV systems are *operated and managed* influences their effectiveness (Gill and Spriggs 2005, Cavoukian 2008): Factors like the number and types of cameras (pan, tilt, zoom, multiplexing; resolution; fixed vs. re-deployable), camera coverage (density) of the area, control room operations (staffing; 24-hour active vs. passive monitoring; implemented software solution), system management skills, formulated objectives of the scheme, and the involvement of the police and other

[151] Deisman (2003, p. 12) states that "the only thing the literature does show, quite unambiguously, is that CCTV systems do not have uniform effects across crime categories."

law enforcement actors all matter regarding CCTV effectiveness.[152] It is still open to future research to help identify the features, which make schemes a success or a failure (Deisman 2003). Information on these important implementation aspects should be provided by future CCTV studies, especially because these systems need not be static but are being modified and upgraded from time to time.

Fourth, there generally is an *ex post investigative utility* of CCTV, at least as long as the recordings are stored for a long enough time period and the relevant visual information adequately searchable. On the other hand, there is also evidence for learning and adaption in criminal behavior patterns. This potentially undermines the suitability of CCTV as a crime prevention and evidence gathering tool.

Fifth, the *methodological difficulties* in showing a causal relation between CCTV and criminal behavior cannot be underestimated. Especially, various problems arise regarding the identification and isolation of CCTV's effect on crime considering that it is more often than not implemented alongside other security measures.

Finally, it is hardly possible to draw generalizable conclusions on both the possible effects and the effectiveness (regarding crime reduction) of CCTV. There is hardly any evidence unmistakably in favor of or against a general effectiveness of CCTV on criminal behavior. Armitage (2002, p. 1) concludes that there is "very little substantive research evidence, however, to suggest that CCTV works." Cavoukian (2008, p. 10) adds: "A much larger body of research, with a consistent degree of methodological rigor, is needed before definitive statements may be made."

This might not come as a surprise in face of the various methodical and statistical difficulties emerging in the evaluation of situational crime prevention efforts, particularly of fairly new technologies such as CCTV. As a consequence, Future implementation of CCTV schemes need to be carefully considered with regards to the context in which they are implemented as well as the objectives they aim to achieve. Above all, they should "employ high quality evaluation designs with long follow-up periods" (Welsh and Farrington 2007, p. 8) because „exactly what the optimal circumstances are for effective use of CCTV schemes is not entirely clear at present, and this needs to be established by future evaluation research" (id., p. 46).

[152] E.g., as long as first-generation CCTV systems with relatively low-resolution standards are implemented, only very few crimes are detectable ex post. Clark (2008) reports only three per cent of London street robberies being solved by CCTV.

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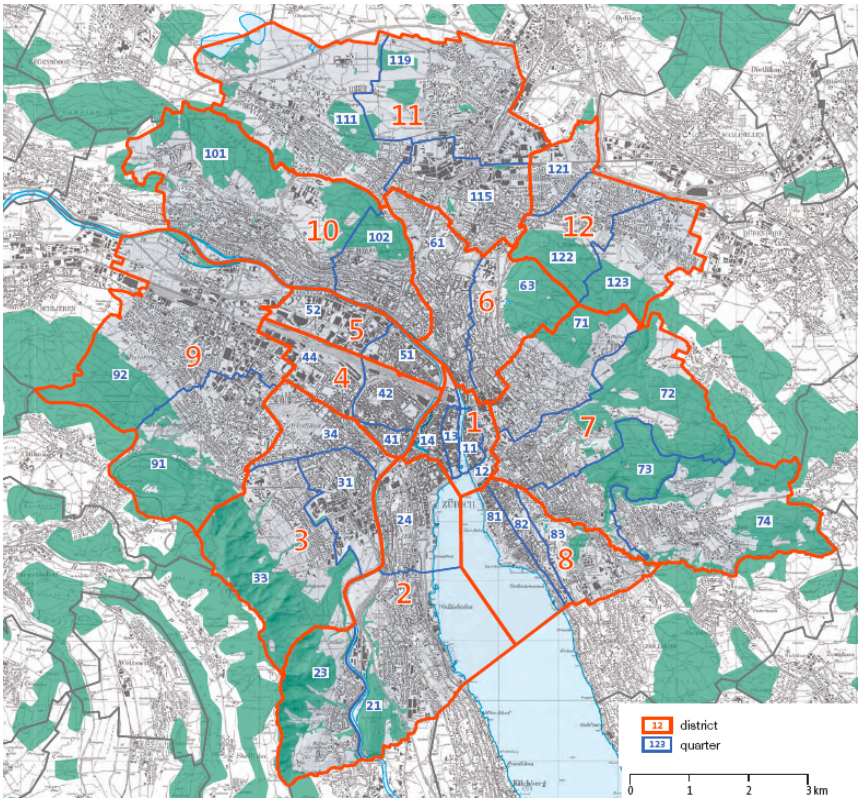
APPENDIX

Figure A.1: Neighborhoods in Zurich (Switzerland)

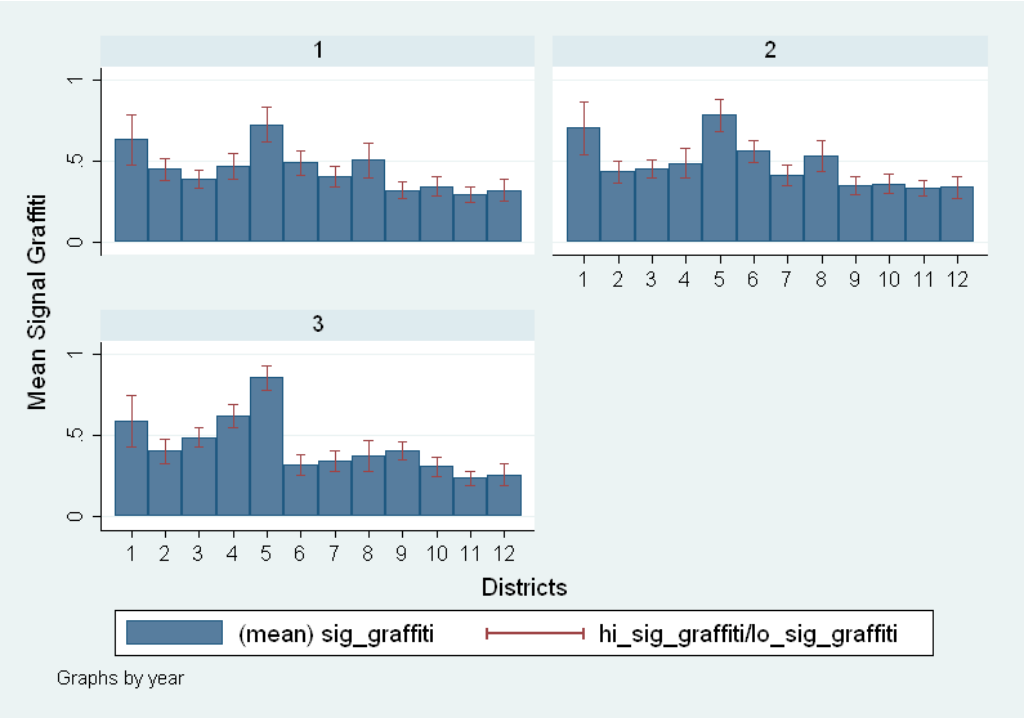
Source: Wikipedia: The Free Encyclopedia (2009)

Figure A.2: City Districts and Neighborhoods in Zurich (Switzerland)



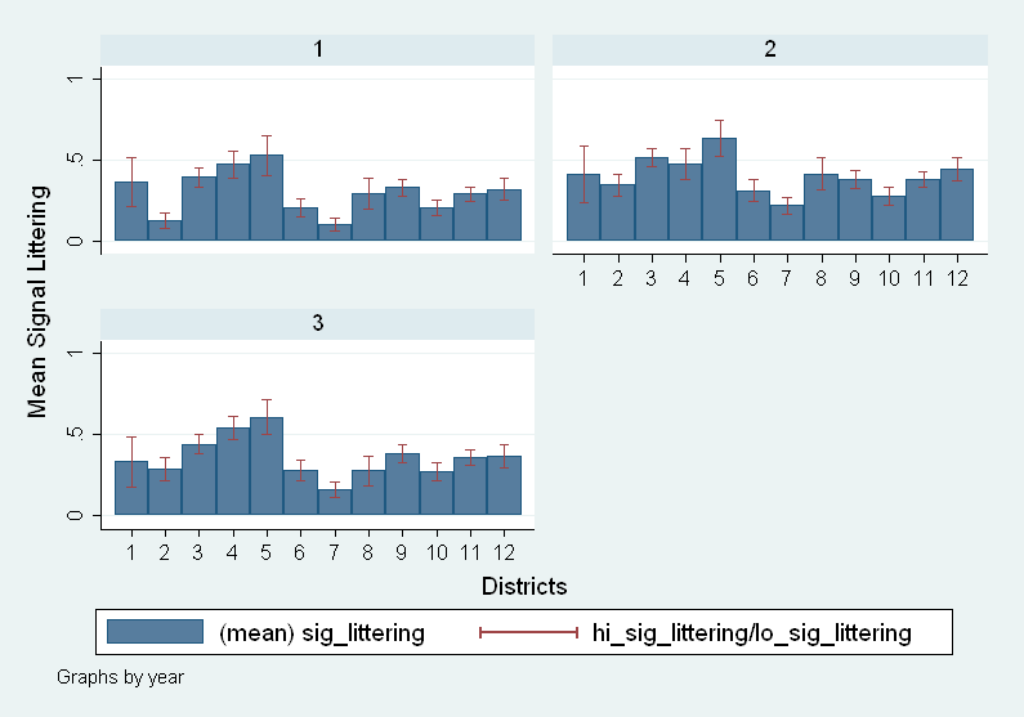
Source: City of Zurich (2008),

Figure A.3: Average Visibility of Graffiti, per Survey Wave and District



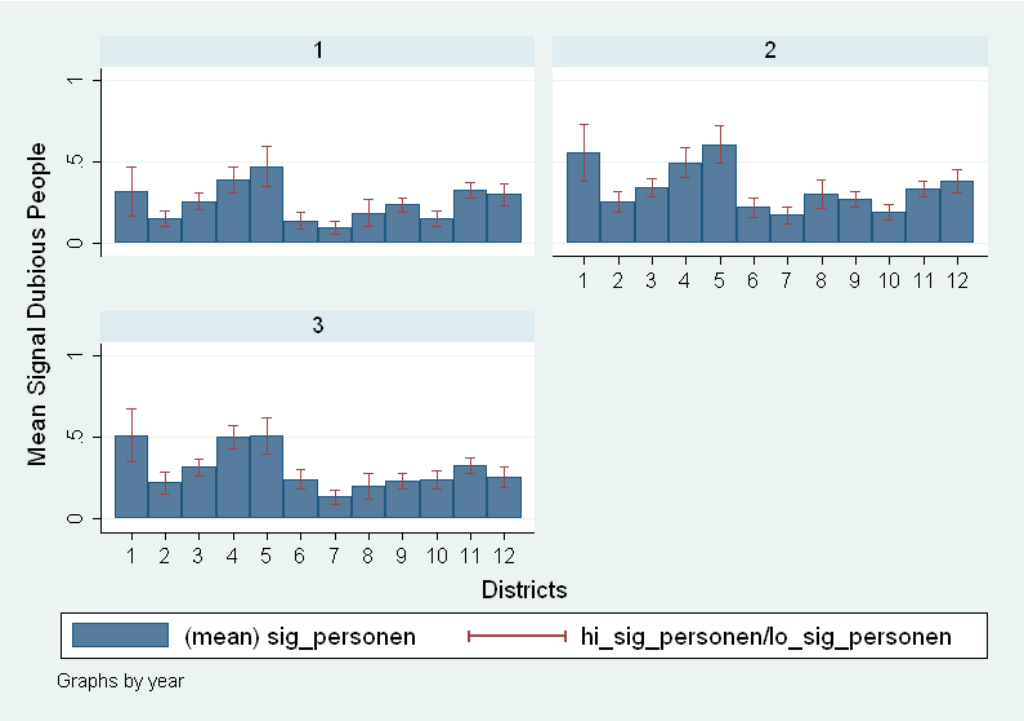
Note: Survey wave 1 was implemented in 1994, 2 in 1996, and 3 in 1998.
Source: Own calculations based on Zurich Crime Survey.

Figure A.4: Average Visibility of Littering, per Survey Wave and District



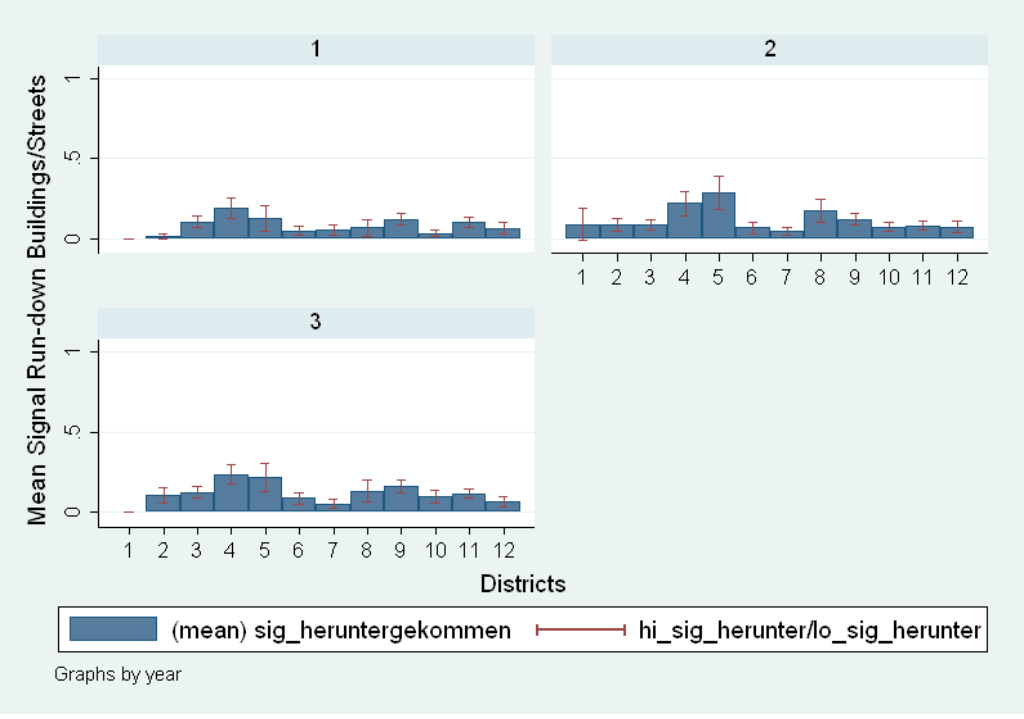
Note: Survey wave 1 was implemented in 1994, 2 in 1996, and 3 in 1998.
Source: Own calculations based on Zurich Crime Survey.

Figure A.5: Average Visibility of Dubious People, per Survey Wave and District



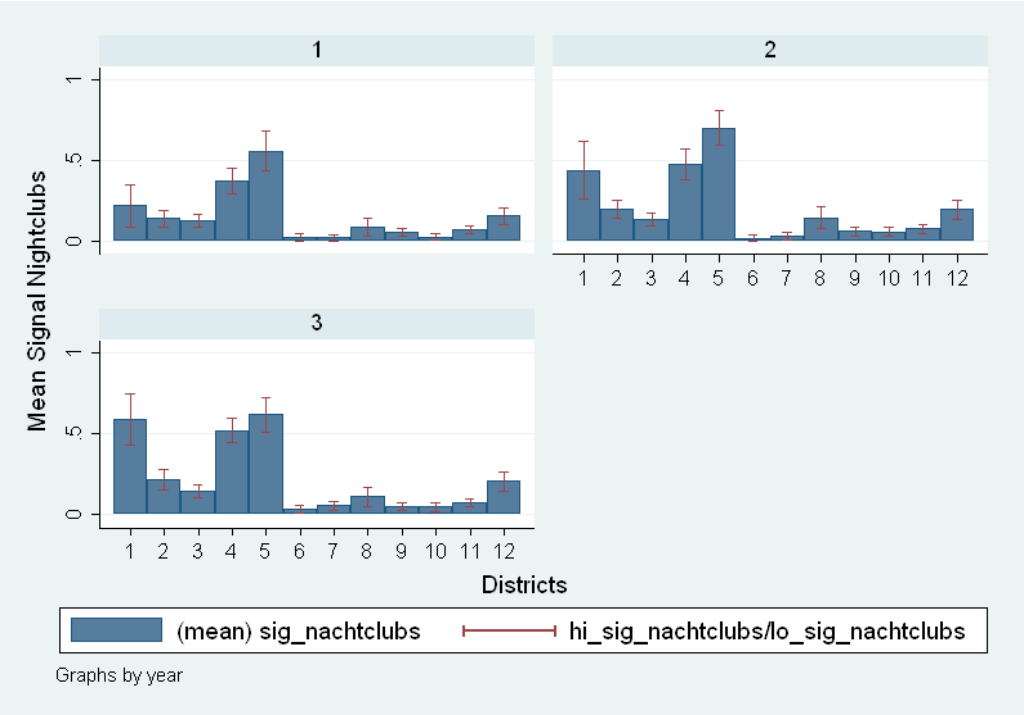
Note: Survey wave 1 was implemented in 1994, 2 in 1996, and 3 in 1998.
Source: Own calculations based on Zurich Crime Survey.

Figure A.6: Average Visibility of Run-Down Houses or Street Lines, per Survey Wave and District



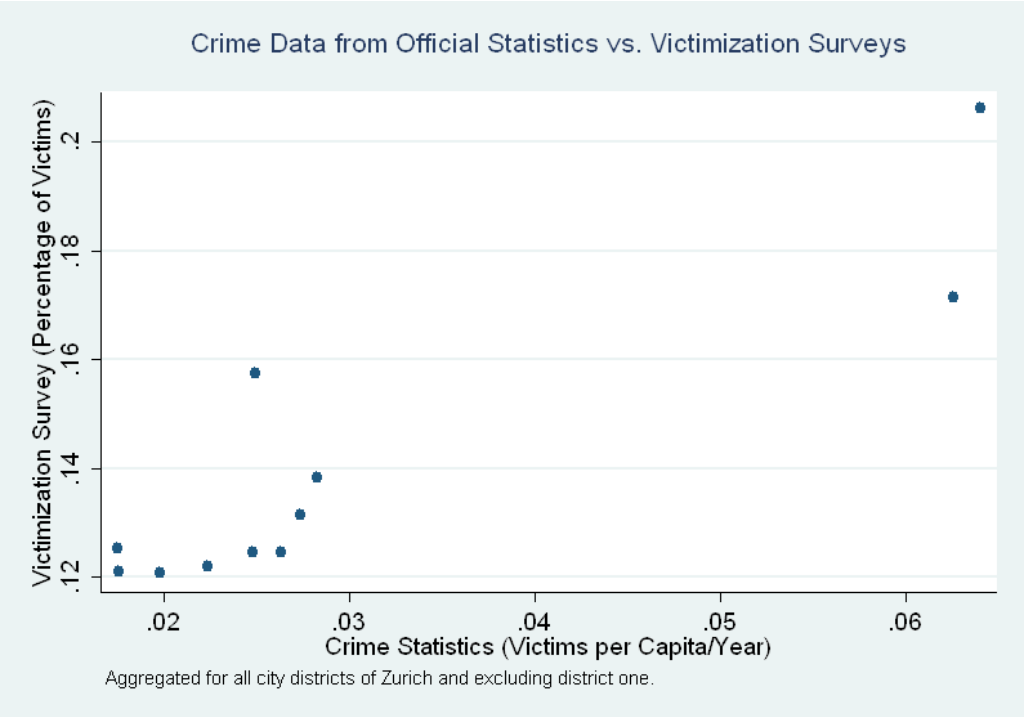
Note: Survey wave 1 was implemented in 1994, 2 in 1996, and 3 in 1998.
Source: Own calculations based on Zurich Crime Survey.

Figure A.7: Average Visibility of Nightclubs and 'Red-Light' Bars, per Survey Wave and District



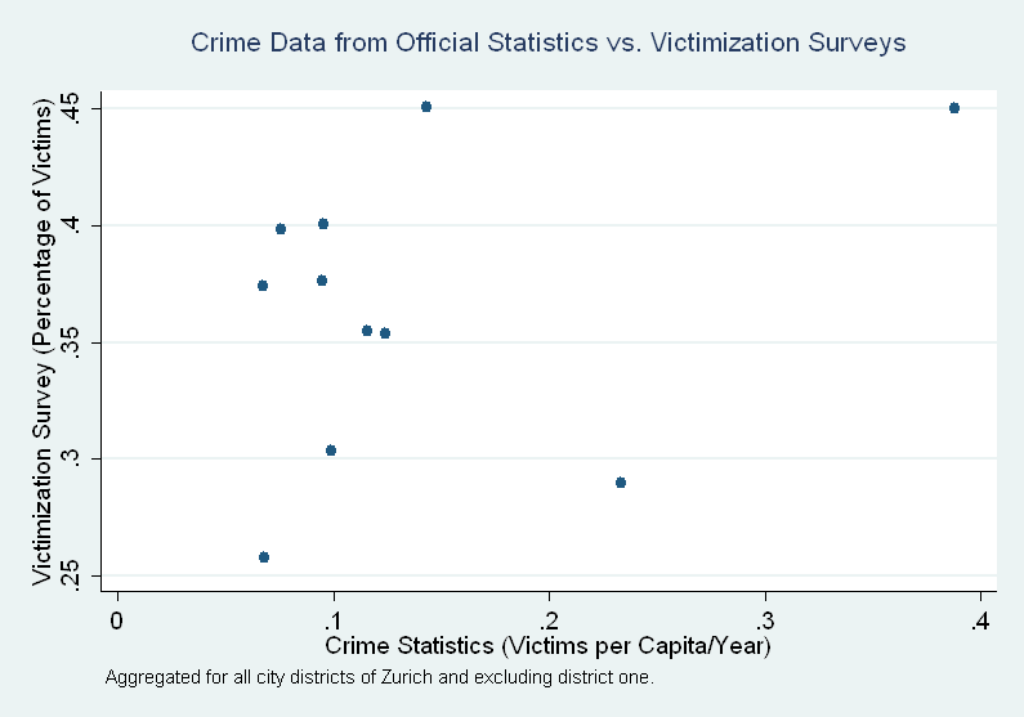
Note: Survey wave 1 was implemented in 1994, 2 in 1996, and 3 in 1998.
Source: Own calculations based on Zurich Crime Survey.

Figure A.8: Violent Crime – Police Crime Records and Victimization Surveys (Excl. District 1)



Sources: Zurich Statistics Office, Zurich City Police Department, Zurich Crime Survey.

Figure A.9: Property Crime – Police Crime Records and Victimization Surveys (Excl. District 1)



Sources: Zurich Statistics Office, Zurich City Police Department, Zurich Crime Survey.

Table A.1: Individual Victimization and Socio-Demographic Characteristics

	Victim Violence		**Victim Property**	
	(I)	**(II)**	**(III)**	**(IV)**
Male	0.338***	0.127***	0.055	0.015
	5.47	5.54	1.00	0.56
Age	0.006***	n/a	0.015***	n/a
	3.08		6.81	
(Age^2)/100	-0.008***	n/a	-0.013***	n/a
	-4.27		-6.30	
Age Cat. Very Young	n/a	Ref. Group	n/a	Ref. Group
Age Cat. Young	n/a	0.025	n/a	0.080***
		0.72		4.15
Age Cat. Middle	n/a	0.050	n/a	0.119***
		1.91		5.02
Age Cat. Old	n/a	-0.005	n/a	0.147***
		-0.19		6.04
Age Cat. Very Old	n/a	-0.081**	n/a	0.084**
		-2.91		2.81
Income High	-0.028***	-0.027**	0.008	0.006
	-2.91	-2.71	0.77	0.61
District 11 *(Largest Pop.)*		Reference Group		
District 1	0.084***	0.081***	0.028***	0.029***
	22.67	19.79	4.50	5.42
District 2	-0.015***	-0.015***	-0.032***	-0.032***
	-7.42	-7.54	-23.91	-25.65
District 3	0.021***	0.022***	-0.002*	-0.004*
	22.29	25.82	-2.04	-2.56
District 4	0.024***	0.024***	-0.077***	-0.079***
	6.32	5.42	-24.10	-22.39
District 5	0.058***	0.060***	0.049***	0.049***
	26.72	27.47	18.95	18.53
District 6	-0.016***	-0.016***	-0.001	-0.003
	-6.02	-5.46	-0.37	-0.88
District 7	-0.012***	-0.014***	-0.010*	-0.011*
	-3.46	-4.06	-2.28	-2.50
District 8	0.002	0.003	0.043***	0.044***
	0.85	1.01	13.81	14.04
District 9	-0.006***	-0.007***	-0.050***	-0.050***
	-6.75	-5.76	-41.94	-30.82
District 10	0.000	-0.001	-0.020***	-0.021***
	-0.24	-0.53	-8.71	-9.47
District 12	-0.004*	-0.004	-0.092***	-0.091***
	-2.28	-1.65	-30.75	-29.85
Individual Characteristics		Included		
Constant	0.133**	0.220***	-0.003	0.292***
	2.61	8.27	-0.04	11.46
N	6982	6982	6982	6982
R squared	0.0379	0.0391	0.0597	0.0586

Notes: Individual Characteristics include: Age x Male, (Age^2)/100 x Male, Age Cat. x Male, Education, Occupation, Foreigner, Lives in Appartment, Single Person Household, Survey Wave.
Partial correlates from OLS regressions; coefficients above t-statistics.
Significance levels: *.05<p<.01, **.001<p<.01, ***p<.001.
Source: Own calculations based on Zurich Crime Survey.