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## Convergence of Traditional and Online Property Crime Victimization in a City with Little Offline Crime

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### ABSTRACT

This paper analyzes the correlates of traditional (burglary, vehicle theft, theft from vehicles, and pickpocketing) and online property crime (data theft and online fraud), with particular attention given to the relation between them and the risk of multiple victimizations. Data are gathered from a large and representative victimization survey conducted in a Swiss city (N = 7,885). The findings suggest that both traditional and online property victimization are related positively to the participants' lifestyle routines, physical and online protection measures, and educational level. Men, young persons, those employed actively, and university graduates are overrepresented among the multiple victims of online-offline property victimization.

### KEYWORDS

Property crime; multiple victimizations; victimization survey; routine activity approach; lifestyle crime theory

### Introduction

The dichotomy between everyday life in the physical and digital worlds has become obsolete in the population of highly industrialized countries, as both worlds coexist. For example, by 2019, all inhabitants of Switzerland aged 15 to 55 years had an Internet connection at home, and 80% of them had access to the Internet from their smartphones. In addition, approximately 75% had purchased goods online in the previous three months and, among those, 87% paid at least once by credit card, while 55% paid at least once via e-banking (Office fédéral de la statistique, 2019). This physical and digital coexistence affects people's lifestyles and daily activities, which in turn is known to be related to their risk of crime victimization. However, the interactions between crime, lifestyles, and daily activities in the physical and digital world are less well known and, to the best of our knowledge, have not been the object of specific study in Switzerland.

From that perspective, this study uses a victimization survey to investigate the correlates of traditional and online property crime victimization and provide the sociodemographic profile of multiple victims of online-offline property crimes. The analysis focuses on traditional offenses, such as burglary, vehicle theft, theft of objects from vehicles, and pickpocketing, as well as such cybercrimes as online fraud and unauthorized use of personal data. The victimization survey was preferred to official measures of crime,

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such as police and conviction statistics, because the latter's limitations are well known and appear to be particularly relevant in the field of cybercrimes. Nonetheless, from 2011 to 2016, cyber-fraud recorded by the police increased in the majority of European countries that collect data on it, while traditional patrimony crimes, such as theft, aggravated theft, vehicle theft, and burglary, showed decreasing trends in nearly all countries, with the exception of domestic burglary, which has a trend that presents a less clear pattern (Aebi et al., 2021). However, cross-national comparisons of levels of police-recorded crimes are biased fundamentally because of differences in the way in which data are registered in national statistics (Aebi, 2010). For example, this explains why the Swiss police recorded “only” 57.5 cyber-frauds per 100,000 inhabitants in 2015, while the Swedish police recorded 1,100. At the same time, by 2020, 70% of police-recorded frauds in Switzerland had a cyber component (Office Fédéral de la Statistique, 2021).

These figures corroborate the notion that the technological revolution that led to contemporary societies' digitalization has provided *breaches* (in the sense of Killias, 2006) for new types of crime as well as updated forms of traditional crimes. Hence, the risk of becoming a crime victim, which entails numerous negative consequences, has multiplied (Notté et al., 2021; Reyns & Randa, 2020). These breaches also lead to repeated and multiple victimizations. Repeat victims are those who suffer the same offenses regularly (e.g., robbery *or* cyber-fraud), while multiple victims, or multivictims, are those who suffer consecutive crimes of a different nature – for example, robbery *and* cyber-fraud. Several authors have investigated repeated victimization in both the material and cyber world (e.g., Everson, 2003; Farrell, 1993; Matthews et al., 2001; Milani et al., 2020; Moneva et al., 2022, 2020; Whitty, 2019), while few have addressed multiple cyber-victimizations (Correia, 2020; Drew, 2020). With respect to prevalence, Correia (2020) found that among the 11,844 participants in the Crime Survey for England and Wales, 8.5% had been victims of both fraud and computer misuse, 7% of fraud only, and 1.8% of computer misuse only. In addition, multiple cyber-victimizations had a greater incidence rate (10.2 crimes per 1,000 respondents) than that of both crimes separately. Drew (2020) studied multiple cyber-victimizations in Australia (N = 595) and found that 27% of the sample had experienced two or more different cybercrimes, including identity theft, fraud, phishing, computer hacking, malware or ransomware attacks, online shopping scams, online dating and romance scams, password theft, and unauthorized access of cards or bank accounts.

Research on multiple victimizations in both the traditional environment and cyberspace has focused on bullying (see, Trajtenberg et al., 2021; Turner et al., 2010; Wang et al., 2010) or has linked cyber and traditional forms of peer victimization to the internalization of symptoms – such as depression, anxiety, and sadness – in adolescents (e.g., Andrea & Álvarez-García, 2021; Fales et al., 2018; Gini et al., 2019). At the same time, we are unaware of any studies that have investigated the prevalence and correlates of other types of traditional and cyber forms of multiple victimizations. From a practical perspective, this lack of research is particularly regrettable, as it is well known that the Pareto law (vulgarly known as the 20/80 law) also applies to the distribution of crime, in the sense that a small group of victims suffers a large proportion of crime (e.g., Farrell, 1992). This indicates that by focusing crime prevention strategies on that group, one could achieve a noteworthy decrease in the total amount of crime.

## The lifestyle-routine theory: theoretical framework and prior literature

Several criminologists – although not necessarily their respective authors – consider the *Routine activities approach* [RAT] (Cohen & Felson, 1979), and *lifestyle theory* (Hindelang et al., 1978) as complementary theories that help explain the historical evolution and social distribution of the risk of victimization (Garofalo, 1987). For example, Killias et al. (2019) grouped them together under the common label of the *situational approach*, which may be seen as a theoretical paradigm. According to this paradigm, crime is the result of an opportunity and it can be prevented by reducing the opportunities to engage in crime rather than by changing human behavior (for details, see, Killias et al., 2019). Similarly, RAT and lifestyle theory have also been combined in the *lifestyle-routine theory* [LRAT] (Reyns et al., 2011), given opportunity theories' appropriateness to explain the trends in criminality and shift in cybercrime (Linde & Aebi, 2020).

In the original version of the RAT, a predatory crime requires the convergence in time and space of a *motivated offender*, a *suitable target*, and the *absence of a capable guardian* (Cohen & Felson, 1979). This approach was developed to explain the increase in crime between 1947 and 1977 in the US. In particular, the increase in burglaries defied the classic prediction that property crime would diminish if socioeconomic indicators – such as life quality, purchasing power, education – improved. Cohen and Felson (1979) postulated that the unpredicted increase in property crime was attributable to greater opportunities that emerged with the social and technological changes of the epoch, e.g., the increase in single-person households, women's integration in the workforce, the augmentation of outdoor leisure, and the miniaturization of electronic devices that rendered household appliances lighter, easier to transport, and consequently, steal. This theory has evolved and been updated progressively, but its core remains similar to the original (Eck & Madensen, 2015).

*Lifestyle theory* (Hindelang et al., 1978) addresses the risk that an individual will become a victim of a personal crime. This theory emerged in part as an attempt to explain the divergence of crime victimization among demographic groups in early US victimization surveys. In that respect, Hindelang et al. (1978) postulated that a person's risky lifestyle was correlated positively with their risk of becoming the victim of a crime. In particular, they found that the risk of victimization was higher for young men than for women and the elderly, and explained that the difference was attributable to the greater amount of time men spent away from home that led to the increased likelihood of encountering risks (Hindelang et al., 1978).

Empirical research has tested and corroborated these theories to some extent. According to several studies, RAT demonstrates adequate power to explain traditional property crime (Argun & Dağlar, 2016; Corcoran et al., 2020; Johnson et al., 2010; Wickes et al., 2017), even if other research has refuted or found mixed support for this result (Massey et al., 1989; Moriarty & Williams, 1996). For instance, Massey et al. (1989) found that only *the amount of crime in the neighborhood* and participants' *type of housing* were related to victimization, but that was not the case for many *guardianship measures* (e.g., from spending time away from the household to having friends and relatives in the neighborhood) except *having a job*. Massey et al. (1989) interpreted this finding by hypothesizing that people who experienced victimization would consequently tend to stay at home more and reduce their exposure to risky situations thereby. Nevertheless, the cross-sectional character of their study did not allow the causal and temporal order of such associations to be

determined. At the same time, Wickes et al. (2017) showed that other factors, such as *neighborhood diversity*, *disadvantage*, and *residential instability*, moderate the relation between guardianship and victimization. From a similar perspective, Moriarty and Williams (1996) found greater support for RAT in socially disorganized areas than in low-crime zones. With respect to the demographic distribution of property victimization, most studies have found that victims are predominantly men and younger people (Massey et al., 1989; Mustaine & Tewksbury, 1998; Wickes et al., 2017). For an exception, see, Moriarty and Williams (1996), who found no significant gender or age differences among the victims, while Van Dijk et al. (1990) demonstrated that a high education level and high income are related to a greater risk of property victimization.

RAT was tested in cyberspace with specific cyber-offenses with promising outcomes, but also interesting nuances and differences from its application to traditional crime (Bossler & Holt, 2009; Choi & Lee, 2017; Holt & Bossler, 2008; Leukfeldt & Yar, 2016; Milani et al., 2020; Navarro & Jasinski, 2012; Reyns et al., 2011; Weulen Kranenbarg et al., 2019; Williams et al., 2019). For example, Leukfeldt and Yar (2016) analyzed RAT's applicability (N = 9,161) to six cybercrimes and found that the *visibility of the target* played a fundamental role in cybercrime victimization, while *accessibility* and *personal capable guardianship* showed varying results, and *valuable and technical capable guardianship* had no effects on the victimization outcome. Other studies have found a positive association between different forms of digital protection (e.g., antivirus) and online victimization, and this correlation may suggest that the absence of security software on personal devices could leave targets unaware of threats and actual victimization (Milani et al., 2020). With respect to the victims' characteristics, they differ sometimes from the traditional profile of a young man; for example, Reyns (2013) and Reyns et al. (2019) found that older men and persons with a high income were the groups most at risk of experiencing cyber victimization by identity theft.

Finally, the application of *lifestyle-routine activity theory* to various forms of traditional crime (Estrada & Nilsson, 2008; McNeeley, 2015) and cyber offenses (Guerra & Ingram, 2020; Holt & Bossler, 2008; Ngo & Paternoster, 2011; Suh et al., 2020; Vakhitova et al., 2016) has also yielded mixed empirical findings, particularly vis-à-vis cybercrime. In cyberspace, *online exposure* usually enhances the risk of becoming the victim of a virus attack, computer hacking, online identity theft, or fraud (Guerra & Ingram, 2020; Holt et al., 2020; Reyns, 2013; Reyns & Randa, 2020; Reyns et al., 2016). However, Holt and Bossler (2013) found no relation between online activities (e.g., online shopping; playing video games; checking e-mail; using chatrooms) and malware infection. Further, *target suitability* is not generally applicable to all types of cyber-offenses. In particular, clicking or opening links was related to virus infection (Ngo & Paternoster, 2011) and posting personal information to phishing, hacking, and malware victimization (Reyns, 2015). Nevertheless, some researchers have found results that contradict the theory (Guerra & Ingram, 2020; Holt & Bossler, 2013; Ngo & Paternoster, 2011; Reyns et al., 2011). In general, the most pivotal deviation concerns the *presence of guardianship*, which should decrease victimization theoretically, but whose direction in cyberspace is often the converse. Again, this weak negative association between guardianship and victimization is the result of the lack of temporal dependency in cross-sectional studies (Guerra & Ingram, 2020).

## Research questions

In this study, the lifestyle-routine activity theory mentioned above provides the baseline for the empirical investigation of the correlates of traditional and online property crime victimization and the sociodemographic profile of multiple victims of online-offline property crimes, an under-studied population from this perspective. In this respect, this study seeks to answer the following research questions:

- (1) What factors predict exposure to traditional and online property victimization?
- (2) What sociodemographic characteristics do multiple victims of online-offline property crime share?

By answering these questions, we provide a first look at multivictims of property crime in both the material and virtual world and, while profiling vulnerable victims, we establish a framework with which to design specific preventive strategies.

## Data and methods

To answer the research questions, this study relies on a large representative, stratified random sample of citizens aged 16 to 84 years old living in Lugano, Switzerland (for details on the survey, see, Caneppele et al., 2019). The survey was conducted from January to April 2019 by the Criminology Research Unit of the School of Criminal Justice at the University of Lausanne, and asked citizens about their past victimization experiences, including several property crime-related offenses. A total of 7,885 of 14,717 citizens participated in the survey: a response rate of 53%.

### *Operationalization of variables*

#### *Traditional and online property crime*

The survey asked respondents about different types of traditional and online victimization episodes over the last five years. Traditional property crime victimization (hereinafter, TPC) comprised the following offenses: (1) burglary; (2) vehicle theft; (3) theft of objects from vehicles, and (4) pickpocketing. 7% of the total number of participants were victims of burglary, 5% of vehicle theft and theft of objects from vehicles, and 4% of pickpocketing over the previous five years. Hence, 17% were victims of traditional property crimes over that period.<sup>1</sup> These figures reveal a lack of accentuated overlap between victims, and thus, heterogeneity among the profiles of the victims of the four offenses. On the other hand, online property crime victimization (hereinafter, OPC) involves (1) online fraud and (2) unauthorized use of personal data. Approximately 25% of the respondents were a victim of (at least) one of the two offenses over the last five years, particularly online fraud (18%), followed by unauthorized use of personal data (13%). The TPC and OPC indicators represent the dependent variables of this study. [Table 1](#) summarizes the descriptive statistics.

**Table 1.** Victimization rates.

Victimization	Obs.	Mean	SD	Min.	Max.
<i>Traditional Property Crime</i>	7,747	0.17	0.38	0	1
Burglary	7,735	0.07	0.26	0	1
Theft of objects from vehicles	7,601	0.05	0.21	0	1
Vehicle theft	7,567	0.05	0.22	0	1
Pickpocketing	7,614	0.04	0.20	0	1
<i>Online Property Crime</i>	6,476	0.25	0.44	0	1
Unauthorized use of personal data	6,438	0.13	0.34	0	1
Online fraud	6,447	0.18	0.39	0	1

Source: Authors' own elaboration of Caneppele et al. (2019)

### **Lifestyle-routine activities**

Consistent with the previous research presented, this study investigates the lifestyle-routine activities of respondents over a range of traditional and online practices that reflect the most popular activities in which individuals engage regularly. To account for offline activities, we consider the time spent outdoors measured as the number of hours spent away from home daily and the number of evenings spent outside weekly. We generate two dummy variables in which we code as 1 those respondents who reported that they spend five or more hours away from home daily or go out three or more evenings weekly. In the digital environment, participants' routine activities concern (1) the frequency of daily social media use, and (2) the frequency of online shopping, ordered on a scale from 1 "I do not do it" to 4 "I do it very often." For each activity, increases in frequency should result in greater exposure to motivated offenders and thus, a greater likelihood of being a victim of crime.

### **Self-Guardianship**

We consider several forms of self-guardianship, conceptualized as tools or behaviors that may prevent or protect a person from crimes, or self-guardianship attitudes that reveal a certain degree of risk awareness of the potential to be a victim of property crime. To cope with the heterogeneity of the offenses contained in the TPC indicator, we generate a single proxy of protection measure as the sum of a variety of tools and behaviors, as exhibited in the following statements: (1) I always keep my windows and doors locked; (2) I ask my neighbors to collect the correspondence when I am on holiday; (3) I leave the light on in my home when going out; (4) I have a burglar alarm system installed; (5) I get free advice from police security consultants on how to reduce the risk of burglary; (6) I am careful not to leave any valuable objects in my car; (7) I always lock my bag, and (8) I have purchased a car camera (dash cam). The result is a count variable with a maximum value of eight for respondents who take the utmost precautions. With respect to online behaviors, we consider the presence of the following protection measures as proof of self-guardianship: (1) I have installed an antivirus software on personal laptops; (2) I have activated a personal identification number (PIN) code (e.g., a PIN, fingerprint, or facial recognition) on a personal smartphone to prevent unauthorized access, and (3) I have noted the bank's emergency telephone number to block a credit card in case of theft or loss. Once again, we generate a count variable with a maximum value of three if respondents adopt all of the protection measures mentioned above.

### ***Perception of security/risk awareness***

The perception of security can also affect the likelihood and frequency of certain activities and behaviors that minimize the risk of becoming a victim of crime. To cover this concept's multidimensionality, we measure the perception of security by combining a set of variables related to (1) respondents' feeling of safety, (2) concerns about crime and deviance in the neighborhood (e.g., worry about burglary, vehicle theft, pickpocketing, but also drug dealing and drug consumption, or vandalism and littering), and (3) witnessing crime and deviance in the neighborhood (e.g., drug dealing and drug consumption, alcohol consumption, vandalism, littering)<sup>2</sup> into a composite indicator that ranges from (0) low perception of security to (1) high perception of security. With respect to OPC, the perception of security is a simple average of four categorical variables that target the respondents' sense of security in (1) using the Internet, (2) browsing social media, (3) purchasing online goods, and (4) consulting their finances and/or making financial transactions using their e-banking account. Values range from 0 "I do not do it" to 4 "I feel perfectly safe doing it."

### ***Vulnerability of the potential victim***

Another set of factors comprises an array of characteristics that describe the living and socioeconomic conditions of the potential targets of property crimes. We consider three different aspects of respondents' lives. First, we asked respondents about the perception of their self-defense ability and digital literacy to verify whether a strong sense of self can reduce the likelihood of victimization. A dummy variable for self-defense ability indicates respondents who believe that they are fully capable of defending themselves physically against a person of their size. In the digital environment, citizens are classified dichotomously based upon their ability to solve smartphones problems without asking for help. Second, the type of dwelling and presence of cohabitants also provide or reduce opportunities for victimization.<sup>3</sup> We include a dummy variable (and an interaction term) to account for the household type (dummy variable: 0 = living in a residential building; 1 = living in a single-family house) and composition (dummy variable: 0 = living in a family; 1 = living alone). Finally, we include fixed effects for gender (dummy variable: 0 = men; 1 = women), age (continuous), education (categorical variable: 1 = any school title; 2 = high school diploma; 3 = university degree), and employment status (categorical variable: 1 = employed, 2 = unemployed; 3 = inactive; 4 = students). The statistics of the independent variables are displayed in [Table 2](#).

### ***Testing strategy***

Given the dependent variables' binary nature, logistic regression is used to model the effect of the aforementioned independent variables on the likelihood of TPC and OPC victimization. We run two different specifications, including the offline- or online-related variables mentioned in the previous section. The goodness-of-fit tests indicate that the data fit the two models (the Hosmer-Lemeshow Chi-squared test has  $p$ -values higher than 0.05), and the regression is specified appropriately (the Link test rejects the null hypothesis of model misspecification). Nonetheless, the set of independent variables explains the models' observed variation marginally (Pseudo- $R^2 = 0.04$  for the TPC model, 0.08 for the OPC model). As a robustness check, we estimate a bivariate probit regression, which allows two binary dependent variables to be modeled jointly as a function of several explanatory



**Table 2.** Summary statistics of the independent variables.

Independent Variables	Obs.	Mean	SD	Min	Max
5 or more hours away from home daily	7,823	0.28	0.45	0	1
3 or more evenings out weekly	7,817	0.14	0.35	0	1
Frequency of social media use	6,303	2.55	1.11	1	4
Frequency of online shopping	6,327	2.16	1.01	1	4
No. of protection measures	7,757	3.78	1.22	0	8
No. of digital protection measures	7,466	2.00	0.98	0	3
Perception of security	6,713	0.78	0.16	0	1
Perception of online security	6,543	2.24	0.95	0	4
Perception of self-defense (1 = fully capable)	7,787	0.09	0.29	0	1
Perception of IT skills (1 = fully capable)	6,301	0.24	0.43	0	1
Living alone	7,531	0.34	0.47	0	1
Living in a single-family house	7,742	0.16	0.36	0	1
Age	7,690	52.94	17.64	16	84
Gender (1 = woman)	7,865	0.52	0.50	0	1
Employment status*	7,778	1.93	1.06	1	4
Education level**	7,701	2.15	0.66	1	3

\*1 = active; 2 = unemployed; 3 = inactive; 4 = student; \*\* 1 = mandatory school; 2 = high school diploma; 3 = university degree. Source: Authors' own elaboration of Caneppele et al. (2019)

variables. The principal caveat is the presence of a significant correlation between the two dichotomous dependent variables, which, in our case, are correlated positively ( $\rho = 0.18$ ,  $p = .000$ ).<sup>4</sup> The results of the bivariate probit analysis are presented in the appendix (Table A1).

In addition, the individual characteristics of victims of multiple victimizations are associated with victims of one of the two indicators and persons who have not been victims of any property crime. In total, 390 individuals are victims of traditional and online property crimes. In this respect, we adopt both parametric and nonparametric tests to assess whether these groups' individual characteristics differ statistically. For the variable *age*, we run the nonparametric Wilcoxon rank-sum test on the unmatched data (also known as the Mann-Whitney two-sample statistic), the non-parametric *k*-sample test on the equality of medians, and a *t*-test on the equality of means. For *gender*, *education*, and *employment status*, we perform the Chi<sup>2</sup> test and Fisher's exact test.

## Results

The results of the logistic regressions are presented first. Given this study's cross-sectional nature, the interpretation of the results is oriented solely to the identification of correlates rather than cause-effect relations between the independent and dependent variables. Then, we focus on the profiles of multiple victims of both TPC and OPC.

### *Correlates of traditional and online property crime victimization*

In general, TPC victimization is related positively to participants' lifestyle routines and protection measures, as well as their education level, and negatively to their perception of security (Table 3). In this respect, the probability of being a victim of TPC when the time spent outdoors is greater than three days or evenings weekly is 1.4 times higher than when more evenings are spent at home. Nonetheless, there is no correlation between the time spent outdoors during the day and TPC victimization.<sup>5</sup> Further, an

**Table 3.** Binary logistic regression of traditional property crime victimization.

	Odds Ratio	Bootstrapped SE	z	p > z	[10% Conf. Interval]	
5 or more hours spent away from home daily	1.187	0.141	1.45	0.147	1.170	1.205
3 or more evenings out weekly	1.379	0.131	3.37	0.001 ***	1.362	1.395
No. of protection measures	1.107	0.038	2.94	0.003 ***	1.102	1.111
Perception of security	0.140	0.030	-9.22	0.000 ***	0.136	0.144
Perception of self-defense ability	1.108	0.132	0.86	0.392	1.091	1.245
Live alone # Single family house						
In family and in a single-family house	0.956	0.106	-0.40	0.687	0.943	0.970
Live alone in a flat	0.914	0.072	-1.13	0.259	0.905	0.923
Live alone in a single-family house	1.259	0.256	1.13	0.257	1.227	1.291
Age	0.998	0.003	-0.74	0.462	0.997	0.998
Gender (woman)	0.908	0.064	-1.37	0.171	0.900	0.916
Work (baseline = active)						
Unemployed	1.314	0.209	1.72	0.086	1.288	0.946
Inactive	0.853	0.105	-1.29	0.197	0.840	0.924
Student	0.968	0.147	-0.21	0.832	0.950	0.875
Education level (baseline = no titles)						
High School Diploma	1.111	0.133	0.89	0.376	1.095	1.128
University degree	1.350	0.170	2.38	0.017 **	1.329	1.372
_cons	0.563	0.172	-1.88	0.060 *	0.542	0.585
Obs.	6,232					
Wald Chi <sup>2</sup> (Prob>Chi <sup>2</sup> )	153.82 (0.000)					
_hat (P> z )	1.193 (0.003)					
_hatsq (P> z )	0.066 (0.622)					
Hosmer-Lemeshow Chi <sup>2</sup> (Prob>Chi <sup>2</sup> )	12.52 (0.405)					
Cragg-Uhler/Nagelkerke (Pseudo-R <sup>2</sup> )	0.041					

Bootstrapped Standard Errors (500 reps); \* $p < 0.1$ , \*\* $p < 0.05$ , \*\*\* $p < 0.01$

increase in the number of security measures adopted increases the likelihood of suffering property crime victimization slightly (OR = 1.1). High levels of perceived security in the close environment are associated with a lower likelihood of victimization (OR = 0.1). Participants' perception of their self-defense ability or their housing composition are unrelated to TPC victimization. With respect to sociodemographic characteristics, a higher level of education increases the likelihood of being a victim of a property crime (OR = 1.4). However, neither gender, age, nor employment situation appear to play a role in participants' TPC victimization.

OPC victimization is related positively to participants' lifestyle routines, online protection measures, housing composition, and educational level, while it is correlated negatively with the perception of online security and age (Table 4). Therefore, OPC correlates do not differ substantially from those presented in Table 3, and reveal similar patterns between traditional and online property crime victimization. In this sense, an increase in routine online activities is related to an increase in the likelihood of OPC victimization: The daily use of social media (OR = 1.2) and the frequent purchase of online goods (OR = 1.6) are related statistically significantly to OPC ( $p < .01$ ). Installing security measures on personal devices is associated slightly (OR = 1.1) with increased online victimization. Participants' high perception of online security is related negatively to their probability of victimization (OR = 0.8). Interestingly, living in a single-family house increases participants' risk of suffering OPC victimization slightly (OR = 1.2). With respect to individual characteristics, we find statistically significant associations between both age and education and OPC victimization.<sup>6</sup> The elderly generally browsed social media and used credit cards to purchase goods online less often than adolescents and adults, and thus have lower

**Table 4.** Binary logistic regression of online property crime victimization.

	Odds Ratio	Bootstrapped SE	z	p > z	[10% Conf. Interval]	
Frequency of social media use	1.156	0.044	3.80	0.000 ***	1.150	1.161
Frequency of online shopping	1.559	0.136	5.07	0.000 ***	1.541	1.576
No. of digital protection measures	1.122	0.044	2.91	0.004 ***	1.116	1.128
Perception of security online	0.826	0.042	-3.76	0.000 ***	0.821	0.832
Perception of IT skills	1.017	0.080	0.22	0.826	1.007	1.027
Live alone # Single family house						
In family and in a single-family house	1.189	0.113	1.82	0.069 *	1.175	1.203
Live alone in a flat	1.031	0.074	0.43	0.669	1.021	1.040
Live alone in a single-family house	1.349	0.299	1.35	0.177	1.313	1.388
Age	0.993	0.003	-2.21	0.027 **	0.993	0.994
Gender (woman)	0.913	0.061	-1.36	0.173	0.905	0.921
Work (baseline = active)						
Unemployed	0.926	0.157	-0.45	0.652	0.907	0.946
Inactive	0.912	0.096	-0.87	0.383	0.900	0.924
Student	0.861	0.115	-1.12	0.262	0.846	0.875
Education level (baseline = no titles)						
High School Diploma	1.615	0.213	3.63	0.000 ***	1.588	1.642
University degree	2.115	0.287	5.53	0.000 ***	2.080	2.151
_cons	0.054	0.018	-8.88	0.000 ***	0.052	0.057
Obs.	5,671					
Wald Chi <sup>2</sup> (Prob>Chi <sup>2</sup> )	262.74 (0.000)					
_hat (P> z )	0.667 (0.002)					
_hatsq (P> z )	-0.143 (0.117)					
Hosmer-Lemeshow Chi <sup>2</sup> (Prob>Chi <sup>2</sup> )	13.08 (0.364)					
Cragg-Uhler/Nagelkerke (Pseudo-R <sup>2</sup> )	0.077					

Bootstrapped Standard Errors (500 reps); \* $p < 0.1$ , \*\* $p < 0.05$ , \*\*\* $p < 0.01$ .

odds of victimization (OR = 0.99). Similarly, users who hold a university degree show a greater probability of victimization (OR = 2.1). However, this was not the case for gender or employment status, which seemed unrelated to the OPC victimization.

### Profiles of victims of TPC and OPC victimization

In this subsection, we compare the individual characteristics of targets of multiple victimizations of both TPC and OPC together with victims of only one TPC or OPC, as well as persons who have not been victims of any property crime. Table 5 presents the differences in the age distribution across groups. According to the Wilcoxon rank-sum test, the age distributions between the groups differ significantly, and have a 58% probability that a random draw from the population of nonvictims returns an older respondent than a random draw from the population of victims who experience multiple victimizations. Similarly, the mean  $t$ -test and the medians' test yields the same conclusions. According to the  $t$ -test, the mean age of a respondent who has not been a victim of

**Table 5.** Age distribution across groups of victims.

	Wilcoxon rank-sum test		Mean $t$ -test			Medians' test
	Prob.> z	P{nonvictim > multivictim}}	Ha: diff $\neq$ 0	Ha: diff < 0	Ha: diff > 0	Ha: diff $\neq$ 0
Nonvictim vs. multivictim	0.000 ***	0.577	0.000 ***	1.000	0.000 ***	0.000 ***
Single victim vs. multivictim	0.006 ***	0.544	0.003 ***	0.999	0.001 ***	0.048 **

In the mean  $t$ -test, the null hypothesis is diff = mean (age of nonvictim or single victim) - mean (age of multiple victim) = 0. \* $p < .10$ ; \*\* $p < 0.05$ ; \*\*\* $p < 0.01$ .

**Table 6.** Differences in individual characteristics across groups of victims.

Individual characteristics	Groups	Chi <sup>2</sup> test	Fisher's exact test	
		Ha: diff $\neq$ 0	1-sided	2-sided
Gender:	Multivictim vs. nonvictim	0.005 ***	0.003 ***	0.006 ***
Man vs. Woman	Multivictim vs. single victim	0.007 ***	0.004 ***	0.008 ***
Education: Other vs.	Multivictim vs. nonvictim	0.000 ***	0.000 ***	0.000 ***
University degree	Multivictim vs. single victim	0.095 *	0.101	0.054 *
Employment status:	Multivictim vs. nonvictim	0.001 ***	0.000 ***	0.001 ***
Active vs Inactive	Multivictim vs. single victim	0.067 *	0.074 *	0.037 **

Fisher's exact 2-tailed test infers that the probability value of the odds ratio differs from 1; Fisher's exact 1-tailed test infers that the probability value of the odds ratio is higher or lower than 1. \* $p < 0.10$ , \*\* $p < 0.05$ , \*\*\* $p < 0.01$

any property crime is significantly higher than that of multiple victims (50.72 vs. 46.25,  $p < .01$ ). Similar (but less striking) results are obtained when single victims vs. multiple victims are compared.

With respect to *gender*, *education attainment*, and *employment status*, we perform the Chi<sup>2</sup> test and Fisher's exact test (Table 6). Before running the tests, we convert education (1 = university degree; 0 = otherwise) and employment status (1 = active; 0 = otherwise) into dummy variables. According to the two tests, the number of men is higher than women and this difference is statistically significant ( $p < .01$ ): the man-woman ratio among multiple victims is 1.27 compared to 0.95 in the groups of nonvictims and single victims. Differences in education (university graduates vs. undergraduates) are also statistically significant when the profile of multiple victims is compared with that of nonvictims (0.45 vs. 0.78,  $p < .01$ ), indicating a higher proportion of victims with a high level of education in the group of multiple victims. As noted above, university graduates are exposed more to both traditional and online victimization. Therefore, the difference between multiple victims and victims of a single crime is less sharp and statistically significant only at  $p < .10$ . Lastly, the active-inactive ratio indicates a higher percentage of active workers within the population of multiple victims than the population of nonvictims (2.11 vs. 1.44) and single victims (2.11 vs. 1.70).

## Discussion

This article documents the correlation between offline and online property victimization and presents the sociodemographic profile of multiple victims of online-offline property crimes. In this context, the five-year prevalence of multiple victims of offline-online property crimes is extremely low in our sample: only 5% of participants reported multiple property victimizations. These figures are much lower than those in previous studies (Correia, 2020; Drew, 2020), although given that none of them compared multiple victimizations online-offline, the differences are contingent on the different phenomena considered. It is also worth mentioning that Swiss cities have experienced a low level of traditional crime since the 1970s, as noted in Clinard's (1978) classic book, *Cities with little crime: The case of Switzerland*. If we focus on multiple victims of property crimes, our results suggest that, in comparison with single-victims and nonvictims, multivictims are younger, in higher proportion men, highly educated, and actively employed.

Considering TPC and OPC separately, both indicators of property crime are correlated with an increase in crime prevention measures and a lifestyle that includes greater exposure to crime victimization. The latter implies that the longer the time spent online or outside the household at night, the greater the risk of victimization. The finding for traditional crimes

coincides with the original version of lifestyle theory (Hindelang et al., 1978), and for online crimes, coincides with previous research on that topic (Guerra & Ingram, 2020; Holt et al., 2020; Reyns, 2013; Reyns et al., 2011; Reyns & Randa, 2020; Reyns et al., 2016). In contrast, the time spent away from home during the day is not correlated with the risk of property victimization, despite the fact that one of the offenses studied is burglary, a finding that is not completely consistent with the predictions of routine activities theory (Cohen & Felson, 1979), and thus warrants further research in a world in which telework is increasing rapidly.

Consistent with previous victimization surveys (for a review, see, Castro-Toledo, 2019), victims of property crimes had a lower perception of security than nonvictims. Contextual awareness may serve as a significant guardian in both the traditional world and cyberspace, and deter citizens and users from engaging in hazardous or prohibited behaviors that can expose them to (cyber) threats. Further, educational attainment is associated with a higher risk of crime victimization. According to previous research, the level of education influences a person's lifestyle given the increased availability of, and access to, resources (Van Dijk et al., 1990; Van Kesteren et al., 2000). Our findings match these results for both traditional and online victimization. The latter may be attributable to the fact that a high level of education seldom implies manual work, and respondents with higher educational levels usually use IT more frequently, which increases their time spent online and hence the risk of that form of victimization. However, other individual variables affect neither TPC nor OPC victimization. Concretely, *employment status* and *perception of self-defense ability* or *IT skills* are not related to victimization, in contrast with theoretical expectations (Hindelang et al., 1978; Massey et al., 1989; Mustaine & Tewksbury, 1998; Wickes et al., 2017). Vis-à-vis the latter, it seems plausible to consider that self-defense perception (which corresponds to vulnerability perception, in the sense of Killias & Clerici, 2000) affects violent crimes more than property crimes.

The previous sections imply some degree of causal reasoning, which is the Achilles' heel of cross-sectional research: This is particularly troublesome when trying to explain the correlation between the use of crime prevention measures and the risk of crime victimization, a result that is consistent with previous research (Guerra & Ingram, 2020; Massey et al., 1989; Milani et al., 2020; Ngo & Paternoster, 2011). The lack of a retrospective question – which Van Dijk et al. (1990) introduced in this kind of questionnaire first – about the moment in which respondents adopted these measures does not allow us to conclude whether prevention failed or whether some protective measures (e.g., installing a burglar alarm system or a security software) were adopted in a response to previous victimization to avoid repeated episodes in the future. In addition, persons who do not apply strong protective measures in the online world may become victims of personal data breaches without even realizing it, and therefore, be unable to disclose that event in a victimization survey.

Other limitations are of importance and relate to (1) the design of the questionnaire and (2) modeling choices. The victimization survey was not designed to measure all of the theoretical principles in opportunity theories. For example, to avoid a lengthy questionnaire, we did not include any elements from the general theory of crime (Gottfredson & Hirschi, 1990) – which combines opportunities with self-control – and according to previous research, increases the offending and victimization risk (Pratt et al., 2014) and the cyber-victimization risk in part (Pratt et al., 2014; Reyns et al., 2019). In addition, the criminological literature suggests that online fraud may be related to specific web browsers and operating systems, which constitute variables that are often beyond individuals'

knowledge and control (Maimon et al., 2015). Hence, in this study, we did not ask the respondents for technical details of their Internet connections and devices. Further, while participants would probably know if they were victims of robbery, burglary, pickpocketing, or car theft, it is less clear whether they noticed whether they were victims of data breaches, for example. The latter poses a problem of validity and reliability that is inherent to cybercrime research. Accordingly, researchers are trying currently to adapt the questionnaires to the victims' technical knowledge (Junger & Hartel, 2022), but we did not engage in that kind of development. The last challenge concerns the composite indicator of property crimes, the use of which was inevitable because of the low prevalence of property crimes that the interviewees reported. This choice imposed the risk of an aggregation bias attributable to combining different crimes (house theft vs. pickpocketing), and reduced the ability to identify any differences in the correlates of each offense. The low Pseudo- $R^2$  value of the main specification is a partial effect of this limitation. Future research should consider these shortcomings to obtain reliable results.

## Conclusion

This study investigated the relation between lifestyle, routine activities, and traditional and online property crime victimization with a sample of Swiss respondents. The evidence suggests that the frequency with which individuals expose themselves to potential victimization influences their likelihood of becoming a victim of patrimony crimes, including burglary, theft, pickpocketing, unauthorized use of personal data, and online fraud. Policymakers should attend to this association and develop prevention strategies and law enforcement programs tailored to multiple victims – i.e., a small group of victims that endures a large proportion of crime – without discouraging the everyday activities of millions of people. We recommend that prevention strategies should protect against repeated episodes of victimization, support victims of repeated crimes over time, and increase awareness of those offenses that might be imperceptible, and therefore difficult to address and prevent (e.g., unauthorized use of personal data). Increasing awareness of the risks associated with certain routine activities is crucial to reduce people's feelings of insecurity and their fear of experiencing repeated forms of victimization in the future. This is even more important for those victims whose exposure to property crime victimization is higher, particularly men, young persons, those employed actively, and university graduates, who, according to this study, are at greater risk of multiple victimizations in both the traditional world and cyberspace.

## Notes

1. The low rates of self-reported victimization do not allow each offense to be investigated individually.
2. The composite indicator is the result of a principal component analysis (PCA), the factors in which meet the PCA assumptions (eigenvalue > 1, explained 70% of the variance overall, each component explained at least 10% of the total model variability) and are aggregated based upon the proportion of variance each component explains (Jolliffe, 2002).
3. Reynolds et al. (2016) examined the effect of personal-based guardianship (e.g., the type of living arrangement or the presence of a romantic partner or roommates) in deterring Internet users from engaging in deviant or risky behaviors online.

4. The tetrachoric correlation is used to measure the correlation between the two binary variables.
5. In the bivariate probit regression, the relation between spending five or more hours away from home daily and TPC victimization is significant ( $p < 0.05$ ).
6. In the bivariate probit regression, being a woman correlates negatively with OPC victimization ( $p < 0.10$ ).

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## Appendix

**Table A1.** Bivariate probit regression.

	TPC $\beta$ (Bootstrapped SE)	OPC $\beta$ (Bootstrapped SE)
5 or more hours away from home daily	0.167 ** (0.070)	
3 or more evenings out weekly	0.194 *** (0.056)	
No. of protection measures	0.053 *** (0.019)	
Perception of security	-0.011 *** (0.001)	
Perception of self-defense ability	0.093 (0.072)	
Frequency of social media use		0.075 *** (0.023)
Frequency of online shopping		0.231 *** (0.044)
No. of digital protection measures		0.078 *** (0.023)
Perception of security online		-0.118 *** (0.032)
Perception of IT skills		0.019 (0.049)
Live alone # Single family house		
In family and in a single-family house	-0.025 (0.065)	0.091 (0.059)
Live alone in a flat	-0.060 (0.046)	-0.000 (0.046)
Live alone in a single-family house	0.093 (0.142)	0.174 (0.084)
Age	-0.001 (0.002)	-0.004 *** (0.002)
Gender (woman)	-0.065 (0.046)	-0.071 * (0.040)
Employment (baseline = active)		
Unemployed	0.131 (0.101)	0.023 (0.099)
Inactive	-0.016 (0.071)	0.064 (0.058)
Student	-0.034 (0.090)	-0.110 (0.084)
Education level (baseline = no titles)		
High School Diploma	0.014 (0.076)	0.272 *** (0.076)
University degree	0.112 (0.075)	0.439 *** (0.079)
Obs.	5,268	
Wald (Prob>Chi <sup>2</sup> )	418.53 (0.000)	
/athrho ( $p> z $ )	161 (0.000)	
Wald test of rho = 0 (Prob>Chi <sup>2</sup> )	33.63 (0.000)	

Bootstrapped Standard Errors (500 reps); \* $p < 0.10$ , \*\* $p < 0.05$ , \*\*\* $p < 0.01$ .