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Applying the routine activity approach to crime victimization in rural Southeast Asia

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Thailand Vietnam Socio Economic Panel

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Leibniz Universität Hannover, Universität zu Köln

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TVSEP Working Paper

WP-025

The Thailand Vietnam Socio Economic Panel (TVSEP) is a long-term research project for data collection and scientific analysis funded by the Deutsche Forschungsgemeinschaft (DFG). The high quality panel data sets have been collected in rural areas of Thailand and Vietnam since 2007. The panels cover many important aspects of living standard measures, demography, geography, shocks, risks, expectations and behavioural traits of individuals. TVSEP data is available for scientific research purposes free of charge.

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Applying the routine activity approach to crime victimization in rural Southeast Asia

Ulrike Grote^{1*}, Thanh-Tung Nguyen¹, Trung Thanh Nguyen¹, Frank Neubacher²

Abstract

We use a panel dataset of around 3.500 rural households from Southeast Asia and investigate evidence on crime victimization. More concretely, we ask (1) to what extent are rural people in Thailand and Vietnam affected by crime? And (2) what factors determine rural crime victimization? We use the routine activity approach as the theoretical framework and apply different logit models to identify determinants of crime victimization. We find that 5.46% of the rural households have been victimized, mainly by theft, over the last 12 months, some of them even more than once. Living in a rural region with higher levels of inequality is positively correlated with the likelihood of theft victimization. Households with higher levels of crop commercialization are associated with a higher victimization risk, while households with more livestock and being more specialized in specific livestock species are associated with a lower risk. Moreover, past victimization and exposure to weather shocks are positively associated with the likelihood of being affected by crime. We conclude that rural crime requires attention although overall incidence is low in rural Thailand and Vietnam. Guardianship should be promoted, especially in times of weather shocks. Finally, reducing inequality helps preventing theft.

Keywords: Farm crime, Victimization, Routine activity approach, Logit model, Southeast Asia

JEL: D1, I3, K14, K4, O1, Q1

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1. Introduction

Rural crime victimization can have the nature of shocks which may severely affect rural households in developing countries (Buonanno 2003). Thus, understanding rural crime victimization is important since it can have multiple negative effects on society. First, it has been found to impede income and rural livelihoods of the often deprived and poor small-scale farmers (Fafchamps and Minten 2006; Ganpat and Isaac 2018). Second, it may challenge social cohesiveness in rural communities. Third, burglary and theft affect farming households not only by a loss in property and work time, but also create psychic cost making people feeling unsafe in their living environment and threaten their food security at the household level (Barclay et al. 2001; Ceccato 2016; Neubacher et al. 2019). Finally, it may undermine sustainable development in rural areas (Ceccato 2016; Skaperdas et al. 2009). Thus, the prevention of crime is expected to generate high social and economic returns. It increases the attractiveness of rural areas as a living place and eventually prevents outmigration of young people who are urgently needed in sustaining farming and thus food security in the longer run. This is also in line with the Agenda 2030 of the United Nations which includes the Sustainable Development Goal (SDG) 16 to “promote peaceful and inclusive societies for sustainable development, provide access to justice for all and build effective, accountable and inclusive institutions at all levels” (UN 2020).

To identify the determinants of crime victimization, economic theory suggests to focus on the behavior and motivation of the offender who weighs the costs and benefits associated with a criminal act (Becker 1968; Ehrlich 1973). Accordingly, the costs reflect the risk of getting caught and punished, whereas the benefits derive from financial gains of victimizing a relatively rich target. However, we generally do not have reliable information on the offender due to a lack of victimization studies, particularly from developing countries. Thus, the routine activity approach from Cohen and Felson (1979) has been suggested as theoretical framework to understand and prevent crime victimization (Bunei and Barasa 2017). It can be used to study the likelihood of crimes occurring in rural areas and has been found useful in explaining why certain farm households are more likely to get victimized and which items are more likely to be stolen (Sidebottom 2013; Mears et al. 2007a). It derives from the observation that crime is directly related to daily routines of both victims and offenders resulting in crime opportunities. For a crime to occur, a motivated offender, a suitable target and the absence of guardianship must converge in time and space. There are several studies which have applied the routine activity approach but first they are mostly descriptive in nature (Bunei et al. 2013; Bunei and

Barasa 2017) and second, they either focus on suitable targets (Sidebottom 2013; Mears et al. 2007b) or on guardianship (Hollis-Peel et al. 2011).

The International Crime Victims Survey (ICVS) suggests that people in developing countries are more often and more severely affected by crime than in developed countries (Zvekic and Alvazzi Del Frate 1995; Alvazzi Del Frate 1998; van Dijk 2008; van Kesteren et al. 2014). However, research has mainly focused on developed countries and on urban crime so far but not on rural crime (Ceccato 2016). Rural crimes are often property-related. They include a high percentage of theft of tools and equipment, farm inputs (e.g. fuels, pesticides, fertilizer, water) or field crops (such as maize or wheat, fruits and vegetables, timber) and livestock. But also the destruction of property (i.e. vandalism), arson, or damage from trespassers and hunters commonly happen in rural areas (Bunei et al. 2013; Anderson and McCall 2005; Donnermeyer and Barclay 2005; Barclay and Donnermeyer 2007; Holmes and Jones 2017; Mears et al. 2007a). There are a few studies from Sub Saharan Africa that have examined crime victimization in rural areas such as Tanzania (Neubacher et al. 2019) and Kenya (Bunei et al. 2013; Bunei and Barasa 2017). Overall, however, the evidence of rural crime in developing countries is very limited.

With respect to Asia, research has mainly focused on non-rural crime victimization (i.e. juvenile delinquency, homicide) finding huge regional differences in the prevailing types of crime and across the continent (Liu 2009; Shytov and Pomphet 2007). In terms of rural crime, there is only some evidence of poaching in Vietnam (Ngoc and Wyatt 2013) and in this regard Rosen and Smith (2010) point out that Southeast Asia is seen as a trade hub for illegal wildlife products derived from rural poaching activities.

We aim to answer the following two research questions: (1) To what extent are rural people in Thailand and Vietnam affected by crime? And (2) what factors determine rural crime victimization? Our paper contributes to the given literature by adding evidence on the determinants and impacts of rural crime on household welfare in Southeast Asia. So far, to the best of our knowledge, there is no research available from the region. We apply rigorous econometric analyses to a rich and unique panel dataset of original survey data from Thailand and Vietnam. Our data allows to adequately measure the components and welfare impacts of rural crime from a single dataset as suggested as a welcome extension of given research by Sidebottom (2013). To identify determinants of victimization, we use the routine activity approach and apply different specifications of logit models. The results may help rural households to prevent crime by suggesting some coping or preventive strategies and policies.

The rest of the paper is structured as follows: Section two provides an overview of the theoretical and empirical literature on the routine activity approach as a basis for further analysis. Section three presents the data and the methodology. Section four shows the results and discusses them. Section five summarizes and concludes and points at limitations and further research needs.

2. Literature Review

2.1 Theoretical Literature

There are several theories which help to identify determinants of crime victimization. In economics, Becker (1968) has developed a model of crime and punishment based on the perceived costs and benefits linked to crime. This rational choice approach assumes that individuals make choices and that somebody commits a crime if the expected utility exceeds the utility he or she could get by using the time and other resources for alternative activities (Becker 1968; Ehrlich 1973). While for economists, the costs and benefits of the offenders differ, other disciplines assume that the basic motivation of an offender may differ from that of other persons. Moreover, there are observations of a so-called framing effect which means that decisions often change dramatically, if there are only small changes in the way information is conveyed or if the context changes (Stocké 2002). This suggests that other theories might be more appropriate and it is a response to Dilulio (1996) call for economists to "complexize their models" (p. 3) to ensure that economists' work on crime feeds into research and policy making.

In criminology, there is for example the general strain theory from Agnew (1992) which explains crime with strong negative emotions (in particular: anger) associated with strain or pressure and the lack of coping mechanisms. The situational action theory from Wikström (2014) is a more complex and integrative explanation taking the perception-choice process as a starting point. According to that theory, crimes are committed on the basis of personal experiences and characteristics (e.g. morality, propensity, self-control) which interact with characteristics of their environment and the respective situational factors (person-environment interaction) (Neubacher 2020). However, the situational action theory is not appropriate for our case study since it depends on self-reported delinquency studies with information provided from offenders. We rather do a victimization study with information provided from suitable targets.

We use the routine activity approach – also called theory (i.e. Miró 2014; Bunei et al. 2013) - developed by Cohen and Felson (1979) as a framework to analyze the likelihood and

determinants of certain crimes in rural areas. It derives from the observation that crime is directly related to daily routines of both victims and offenders resulting in crime opportunities and contains elements (i.e. of exposure) which have been ignored in economics so far (Barslund et al. 2007). Rather, it focuses on crime prevention, which is also of great interest to economists due to the high social costs associated with high levels of crime. In addition to a motivated offender, a suitable target must be present, and a capable guardian absent (Cohen and Felson 1979), as described below (Figure 1). With this approach, we can find a solid rationale for why we use certain variables and how they are functionally related to crime victimization or what signs we expect to see.

- Figure 1 about here -

A *suitable target* is an object (mostly property) or a person who may be threatened by a motivated offender. It displays characteristics which make it attractive to a potential offender. *Guardianship* determines whether the offender will commit a crime. It acts as an obstacle to offenders and can be both, human (e.g. through neighbors, friends, relatives, passersby, reliability of and access to the police) and/or non-human (e.g. locks, alarms, watchdog) (Bursik and Grasmick 1993). Finally, a *motivated offender* is somebody who is inclined to commit a crime. He or she can behave rationally by weighing the costs and benefits of committing a crime. However, emotions are likely to be involved as well, as suggested by Bouffard et al. (2000) and these can prove to be a benefit (“thrill”) when committing a crime.

It is the interaction between these three elements, or the circumstances in which a criminal act happens, rather than the characteristics of the offenders or victims. In contrast to economic theory, Cohen and Felson (1979) focus explicitly on the criminal event, not on the offender. They combine rational choice theory with the aspect of a criminal opportunity and usually assume the presence of people who are sufficiently motivated to seize an opportunity (Pesch and Neubacher 2011).

2.2 Empirical Literature

In the empirical literature, the routine activity approach has been applied to a wide variety of subjects ranging from farm crime (Neubacher et al. 2019; Bunei et al. 2013; Bunei and Barasa 2017), cattle rustling (Sidebottom 2013), parrot poaching (Pires 2015), looting of archeological sites (Grove et al. 2018) to cybercrime (Yar 2005).

A number of these articles have focused on the *suitable target* and its characteristics to see how well they help explain risk of crime victimization. Table 1 provides a list of the empirical

variables at individual, household, district and province level that are associated with the routine activity approach. The expected signs of the variables are indicated in brackets. First, general socio-economic factors are considered at the individual level, such as the age, education or marital status of the head of household. These characteristics are partly ambiguous in their results. Second, welfare-related characteristics are considered in the literature. Barslund et al. (2007) relate these characteristics from the lifestyle-exposure perspective based on the assumption that victimization risk increases with indicators related to lifestyle and income (van Kesteren et al. 2014; Clinard and Abbott 1973). In fact, crime is viewed as a by-product of development as wealthy societies provide more suitable targets (e.g. motorcycles, small valuables) and become more materialistic (Shelley 1981; Grote and Neubacher 2016). For example, Cohen and Felson (1979) specify the so-called “hot” targets in terms of their value, inertia, visibility and access (VIVA). Clarke (1999) then broadens the notion of property-related crime mainly to define the choice of a target according to whether it is “CRAVED” (Concealable, Removable, Available, Valuable, Enjoyable, and Disposable). We consider farmland per capita, number of Tropical Livestock Units (TLU) and number of livestock species to specifically represent their available, removable and disposable characteristics. These also reflect in part the wealth status of the farm household, and larger farms –characterized here by more farmland per capita, higher numbers of TLUs and livestock species – are likely to increase the risk of victimization (McCall 2003; Mears et al. 2007b; Anderson and McCall 2005). Finally, the properties of suitable targets can be also affected by shocks such as health or weather-related shocks. This may be due to the increased value of targets as availability decreases in the event of a weather shock, making them more attractive for thieves (Sidebottom 2013). However, health shocks which are often accompanied by a loss of earnings and high medical costs are expected to reduce the attractiveness of targets. Furthermore, sick people more often stay at home which make them less suitable targets, while the use of drugs may make them more vulnerable again due to possible inhibitory effects of drugs (Chalfin et al. 2019; Azimi et al. 2021).

The literature on *guardianship* for crime prevention is a comparatively underdeveloped component of the routine activity approach (Hollis-Peel et al. 2011). It has been found that higher levels of guardianship are associated with significantly lower levels of crime (Cohen and Felson 1979). Guardianship has been described by household or village level characteristics such as household size or male adult share. The unemployment situation in villages might also increase guardianship because jobless individuals are now at home more often (D’Alessio et al.

2012). It also depends on characteristics related to space (or geography) which is stressed as an important dimension of a criminal opportunity (Brantingham and Brantingham 1981). Thus, farm isolation has been shown to increase farm household vulnerability to victimization due to lack of guardianship, as potential offenders are less likely to be detected by victims or witnesses (Fafchamps and Moser 2003; Fafchamps and Minten 2006). The distribution of smaller plots and greater distances between these plots and the homestead are also associated with higher vulnerability to victimization since offenders are less likely to be detected in case of theft of crops, livestock or machinery parts and tools (Donnermeyer et al. 2011; van Dijk 2008; Ganpat et al. 2016).

Describing *offenders* is hardly possible and often ends in speculation and anecdotes. Because criminal offences often go unreported, crime statistics are unreliable and there is a lack of data from self-reported crime studies, particularly from the Global South. Ask victims to characterize the (often unknown) offenders, as Bunei et al. (2013), is not considered a sensible approach. Bunei and Barasa (2017) point out that a major limitation of the routine activity approach is that offenders' motivations can only be assumed to be the need for food, money, drugs including alcohol, or the urge to improve one's lifestyle (e.g. mobile phone theft). However, there is general criminological evidence that most crimes anywhere in the world are committed by young adult males. When youth density is high, more potential offenders become part of the society and the risk of victimization increases. In fact, delinquent youth correlate with poor education and unemployment (UNODC 2018). In pastoralist societies there are definitions of masculinity in which young men are encouraged to steal livestock and cattle (Barrett et al. 2001). Donnermeyer et al. (2011) also pointed out, specifically for rural crime, that farmers are not only harassed by nearby neighbors or individuals, but also by organized groups and passers-by from urban centers. It is also known from the literature that the possession of weapons and vehicles can make crime easier for offenders (Felson and Boba 2010; Pesch and Neubacher 2011).

In summary, literature in economics has largely ignored rural crime and its determinants. Many results and their causal relationships are still unclear. The routine activity approach provides a solid rationale for why we use certain variables and how they are functionally related to crime victimization. Additionally, it causes research to focus on the suitable target and guardianship, rather than the offender for whom we lack reliable evidence. Moreover, all of the above studies are from single countries, and mainly from Sub Saharan Africa. Our paper expands this perspective by providing evidence on rural crime in Thailand and Vietnam.

3. Data and Methodology

3.1 Data

The paper is based on household, village and district data collected in the context of the long-term panel project “Poverty dynamics and sustainable development: A long-term project in Thailand and Vietnam”, in brief the “Thailand Vietnam Socio-Economic Panel (TVSEP)”¹ funded by the German Research Foundation (DFG). This project deals with shocks and their impacts on the wellbeing of rural households. Shocks may include economic shocks, natural disasters such as floods and droughts, or health shocks but they can also occur due to crime such as theft, burglary, fraud, or vandalism. The data of 4,400 rural households from Thailand and Vietnam are from the years 2016 and 2017. In each country, the households were selected in a three-stage sampling design with subdistrict, village and then household classifications. Of these, 3,536 households from 2016 and 3,573 households from 2017 have been used.

In Thailand, the surveys were conducted in the three provinces Buriram, Nakhon Phanom, and Ubon Ratchathani. All three provinces belong to the Northeastern region which is considered to be the “poverty pocket” in Thailand (Healy & Jitsuchon 2007). In Vietnam, the surveys were conducted in the three provinces Dak Lak, Thua Thien Hue, and Ha Tinh. While the latter two are located in coastal regions, Dak Lak is a more mountainous region which is comparably better off due to the dominance of coffee production (Figure 2).

- Figure 2 about here -

We used two survey instruments, namely a household survey and a village survey, which were the same in both countries. The questionnaires for the household survey cover a broad set of questions regarding the socio-demographic and economic conditions of the sampled households. Quantitative information was collected with the help of computer-assisted personal interviews on the exposure to different kinds of shocks including different types of crime experience of the household members. More detailed information was collected about type, frequency and severity of victimization over the last 12 months, the reporting behavior and security measures taken by the households to prevent crime. The main focus was on different questions of everyday crime, in particular various forms of theft (accomplished and attempted), burglary, robbery, fraud, or damage to property. After the interview, each completed questionnaire was cross-checked for plausibility and consistency. The village questionnaire

¹Detailed information can be found on the project website www.tvsep.de.

entails information at the village level, including the distance from the village to the nearest marketplace, the distance from the village to the nearest police station, and if unemployment is a problem in the village.

3.2 Methodology

Our empirical procedure includes the following steps. First, we conduct a descriptive analysis to identify to what extent rural people in Thailand and Vietnam are affected by different types of crime. We then focus on rural crimes as theft of farm outputs (crops, livestock), but also include theft of motorcycles or other vehicles, of mobile phones or other household items and burglary. Second, we operationalize the routine activity approach by examining the relationships between the variables representing the suitable target and guardianship with the probability for a rural household to suffer from crime.

To identify the factors that determine the likelihood that a household will be affected by a criminal event, model 1 is specified by three different logit models: a random-effects logit model, a Firth logit model and a multilevel logit model with the two levels household and village. As conceptualized in Section 2, the probability (Y_i) that household i suffers from crime victimization can be specified as:

$$Y_i = F(T_i, G_i, O_i) \quad (1)$$

where F is the cumulative distribution function of the logistic distribution. T represents characteristics of a suitable target; G is a vector of characteristics of guardianship, whereas O denotes other control variables.

Since our data are from two years, a year dummy is also included in the model. As presented, most of these variables are at the individual and household level, but some of them are at the village level and one at the district and the provincial level. Thus, our model is further specified as:

$$Y_{ivdt} = \alpha + \beta T_{ivdt} + \delta G_{ivdt} + \tau O_{ivdt} + \omega_{ivdt} \quad (2)$$

where Y_{ivdt} denotes the probability that household i in village v of district d suffers from victimization during the last 12 months (year t). Victimization is defined as crime in general (including theft, being cheated at work/business, conflict with neighbors, robbery and vandalism), theft in general, theft of agricultural items (livestock, crops or agricultural products) or theft of personal items (transportation, other items, burglary). T is a vector of individual and household variables; G is a vector of individual, household and village variables; O is the vector

of control variables (e.g. inequality, year, province), and ω is the error term. α is the constant and β , δ and τ are the parameters showing impacts of the independent variables on victimization. The selected vectors are further specified in the following:

$$T_{ivdt} = [age_{ivdt}; education_{ivdt}; marital\ status_{ivdt}; farmland\ p.c._{ivdt}; assets\ p.c._{ivdt}; assets\ p.c.sq._{ivdt}; TLU_{ivdt}; livestock\ species_{ivdt}; motorcycle_{ivdt}; past\ victimization_{ivdt}; health\ shocks_{ivdt}; weather\ shocks_{ivdt}] \quad (3)$$

With respect to the suitable target T , we include at the individual level the variables age, marital status and education of the household head, farmland per capita as well as asset value per capita and asset value per capita squared, and at the household level the number of tropical livestock units (TLU) and the number of livestock species to represent their available, removable and disposable traits, number of motorcycles, whether the households have been victimized in the past and whether they have been affected by health and weather shocks in the last 12 months.

$$G_{ivdt} = [hhsz_{ivdt}; maleadults_{ivdt}; wage\ employment_{ivdt}; trust_{ivdt}; HCI_{ivdt}; mobile\ phone_{ivdt}; distance\ plots_{ivdt}; land\ plots_{ivdt}; paved\ road_{ivdt}; dist_market_{ivdt}; dist_police_{ivdt}; unemployment_{ivdt}] \quad (4)$$

Guardianship (G) is represented by a number of household variables and four village variables. Household characteristics are household size, proportion of male adults in the household, wage employment, trust in neighbors in the village, household commercialization index (HCI), number of mobile phones, distance to plots and number of land plots. The four village variables are existence of a paved road, distance to the nearest police station, distance to the nearest market and unemployment in villages. Other control variables (O) are consumption inequality in the district, year and province dummies.

All monetary variables are measured in 2005 purchasing power parity dollars (2005 PPP\$). Because our data are panel, we use a random effects logit model with robust standard errors to account for potential heteroscedasticity. The variance inflation factor (VIF) diagnostic test is performed and its results do not signal any serious multicollinearity problem (see Appendix A). Since the proportion of victimized households is less than 10%, we also carry out a Firth logit (Penalized Maximum Likelihood Estimation) as well as a multilevel logit model (with two levels: household and village) to test the robustness. The results prove robust across the different models. Table 2 presents the descriptive statistics of the variables which will be used in our econometric models.

- Table 2 about here -

4. Results and Discussion

4.1 Evidence on crime victimization in Thailand and Vietnam

The surveyed households were first asked an open question about their general fears about the future. Concerns about personal health and family problems ranked relatively high. Crime is not seen as the biggest fear, but on average around 11% of the households say it is a fear of the future. This number is slightly higher in Thailand (10.8%) than in Vietnam (8.7%). It still ranks close to natural disaster fears in Thailand and Vietnam. This is interesting as both countries are often affected by natural disasters. They are among the top 5 countries in the world affected by disasters with serious injuries and fatalities.

Rural households from our sample in Thailand and Vietnam were asked to indicate whether their household had been affected by crime in the past 12 months. Table 3 shows that there are 388 victimized households (or 5.46%) in 2016-17, of which 365 households have been affected by one type of crime, 22 by two types of crimes and one household by three types. Just over half of all crimes are related to theft, particularly of livestock, but also of crops and other agricultural produce, transportation and other items. The theft of transportation is the most heavily valued type of theft, with an average loss of nearly USD 2,000 (PPP 2005) per affected household. 84 households also stated that they had been cheated at work or in business during the study period. This is consistent with ICVS findings indicating that consumer fraud is widespread in Asia (van Dijk 2008). This type is classified by the affected households as the most serious crime. At over USD 4,000 (PPP 2005), their estimated damage is on average twice as high as that of transport theft. With an average annual income of around USD 11,000, this can be quite significant for some households. Other types of crime recorded in the survey are – in a decreasing number of households – burglary, conflict with neighbors, vandalism and robbery (Table 3).

- Table 3 about here -

Comparing Thailand and Vietnam, households in Thailand are less likely to be subjected to victimization than in Vietnam (Appendix B). Looking at the type and frequency of victimization separately for the two countries, we find that theft especially of livestock and crops and other agricultural products happens more often in Vietnam than in Thailand. Being cheated is at a relatively higher level in Thailand than in Vietnam, and burglary happens at similarly high levels in both countries. The mean incidence values indicate that Vietnamese households are more severely affected by theft of livestock, crops or other agricultural products and vandalism

than Thai households. With respect to the level of average damage, being cheated results in both countries in the highest levels of damage. Robbery and theft of transportation result in Thailand in more severe average damages than in Vietnam which might be related to a slightly higher welfare level in Thailand as compared to Vietnam. Accordingly, Thai households are more likely to report robbery, theft of transportation and theft of crops and agricultural products to the police than Vietnamese households. However, Thai households are less likely to report work/business fraud to the police than Vietnamese households, probably because they do not trust the police, cannot provide sufficient evidence, or are ashamed or upset of having been scammed. In addition, there is a tendency for people in developing countries to manage crime and conflict with the help of informal support such as village heads or other social institutions (Neubacher et al. 2019).

The households surveyed were also asked whether they take any security and precautionary measures to avoid such crimes (Appendix C). Around 70% of all households stated that they had not taken any security measures. In Thailand, almost 90% do nothing, while in Vietnam it is only 50%. The most commonly chosen security measures are locks and watchdogs, especially in Vietnam. In addition, neighborhood watch and networks, associations or gift givings to increase mutual assistance seem to play some role, particularly in Vietnam.

The surveys in Thailand and Vietnam delved into reporting behavior in more detail by asking “*Who did you report the case to?*”. Only around 40% of the 417 criminal cases were reported. When reported, victim households were more likely to report to the police (18%) than to local institutions such as the village head (12%) or a local government official (7%). The evidence is similar in both countries and comparable to the ICVS, which states that Asians report well under 40% of all conventional crimes to the police (van Dijk 2008). Police forces in developing countries are generally underfunded and often based in cities. Furthermore, police may have no influence on the victimization rate due to unmotivated police officers and inefficient courts (Fafchamps and Moser 2003).

4.1 Determinants of victimization

To analyze the two components suitable target and guardianship of the routine activity approach and their relationships to the likelihood that a rural household will be affected by theft, we present the results from three specifications: the random effects logit model, the Firth logit model and the multilevel logit model with two levels (household and village) in Table 4. In the first specification of each model, we do not include past victimization as one of the explanatory

variables to avoid temporal autocorrelation (column 1, column 3 and column 5) while in the second specification, we include it (column 2, column 4 and column 6). We correct for location and time fixed effects and report the marginal effects. The results are robust and show the same significant factors leading to theft victimization in all six models. The same models were applied to crime in general, agricultural theft and theft of personal items, and yielded similarly robust results (Appendices D, E).

- Table 4 about here -

We first note that some suitable target characteristics appear to be associated with the likelihood of becoming a victim of theft. Thus, single household heads seem to be at a higher risk of theft. This result is statistically significant at the 5% level and could be due to poorer physical condition and lower social status (Bunei 2014; Clinard and Abbott 1973; van Kesteren et al. 2004). With respect to livestock, a lower TLU is associated with higher theft risk. This statistically significant result contradicts our expectation (Mears et al. 2007a; Sidebottom 2013). It may indicate that households more specialized in livestock production are more concerned about livestock security so that they may use fences or keep their livestock indoors. So this variable does not reflect whether livestock are available, but whether they are guarded. In contrast, households with a higher number of different livestock species are associated with a statistically significantly higher risk of victimization. This finding is supported by Sidebottom (2013), who examines self-reported theft data for seven livestock species from 11,280 households in Malawi. He notes that chickens have been identified as the most commonly stolen farm animals as they are easier to remove and dispose of, and easier to capture and to sell. Households that have been victims of crime in the past are more likely to become crime victims again. This result is statistically highly significant, and is supported by Mears et al. (2007a) and Neubacher et al. (2019). It is also consistent with our descriptive finding that a high percentage of Southeast Asian households, 70% on average, do not take security measures and/or the precautions they take, such as watchdog or locks, are ineffective in preventing crime.

Finally, characteristics of suitable targets can be also influenced by shocks such as health or weather-related shocks. We find that weather shocks seem to expose households more to theft in contrast to health shocks. This might be due to the covariate nature of weather shocks affecting several or all households in the village. Natural disasters increase the strain as a cause of criminal behavior, at the same time they weaken the formal (police) and informal social controls (because people are no longer there or can no longer stay) (Agnew 2012). This may be due to the increased value of the targets with decreasing availability making them more

attractive for thieves (Sidebottom 2013). Health shocks however are not interrelated with victimization. This may indicate that farmers might become less attractive targets in case of illness. The offender might be more hesitant (Mears et al. 2007b).

Other characteristics related to the suitable target, which are statistically significant at 10% are age, education and assets. With respect to age, younger people are more and older people less likely to be victimized by theft. This may be explained by the fact that the respect for age is very pronounced in Asian cultures (Vauclair et al. 2017). In addition, it might be also possible that older household heads are more aware of risks and thus more likely to take precautionary measures. Also Kappes et al. (2013) find no age-related change in fear. Their research is grounded on the so-called “victimization-fear paradox”, implying that the elderly are more afraid of becoming victimized than the younger (Bilsky et al. 1993). It is called a paradox since the elderly have the highest fear of crime although they have statistically the lowest risk of victimization. This is mainly explained with their avoidance behavior and the preventive measures regarding crime.

Better educated household heads turn out to be less likely victims of theft. This result can be explained by the fact that more educated household heads are more likely to take precautionary measures. However, households with more assets are more likely to become victims of theft. In fact, crime is often regarded as a by-product of development with societies providing more suitable targets and becoming more materialistic (Shelley 1981; Neubacher and Grote 2016). The variables farmland per capita, assets per capita squared and motorcycle are not correlated with theft.

There are a number of variables which refer to guardianship. However, most variables turn out to be statistically insignificant. This might be explained by the relatively low rate of victimization in Southeast Asia which is also reflected in the observation that many people do not take any security measures at all. The significant result that a higher HCI is associated with a higher exposure to theft can be explained by the observation that first, household members have to go to markets and thus leave their farms unguarded (Omiti et al. 2006). Second, they often follow very predictable routines when going to markets thus lowering guardianship at specific times. Third, commercialization may also increase the exposure to targets e.g. on markets. Finally, commercialized farms are also more likely to have a larger number of workers with some of them being potential offenders, especially if poorly or unfrequently paid as theorized by Bunei and Barasa (2017). The hypothesis that the lower the trust in neighbors in the village, the lower the guardianship and the higher the theft rate (Dilulio 1996; Wilcox et al.

2007) is also partly statistically significant at the 10% level. This finding may reflect increased guardianship through neighbors who watch during absence of the owners. However, it might indicate as well that environmental factors lead to lower victimization because this part of the village is generally inhabited by households that are better protected or more alert. Furthermore, it is also possible that the low victimization rate is not the consequence but the cause of the trust measured (reverse effect). In addition, the number of mobile phones in the household is associated with a slightly higher theft risk. It was hypothesized that mobile phones are related to guardianship because owning a mobile phone will enable a household to call friends, neighbors or police for help (Bhavani et al. 2008). However, the positive association indicates that mobile phones are rather perceived as suitable targets and as an indicator of wealth. All other guardianship characteristics do not show any statistically significant sign in our case study.

Lastly, we control for inequality in the living region which is statistically and significantly positively correlated with theft. This result is confirmed for example by Demombynes and Özler (2005) and Burdett et al. (2003).

- Table 5 insert here -

Table 5 compares the determinants of different types of victimization in Thailand and Vietnam. A more differentiated look at theft of agricultural goods (livestock, crops) and personal goods (i.e. transport) provides some interesting context-specific findings. For agricultural theft, significant determinants are related to farming (livestock variables, farmland per capita, weather shocks, commercialization index). However, with respect to personal theft, assets per capita are more important as a determinant of victimization, as well as trust and owning a mobile phone.

More in detail on agricultural theft, households with a higher number of different livestock species are also associated with a statistically significantly higher risk of victimization. It can be assumed that this is related to chickens, the most commonly stolen farm animals as they are very suitable targets (Sidebottom 2013). This positive correlation also holds for the variables past victimization and farmland per capita. Weather shocks are statistically and significantly correlated with agricultural theft, but not with personal theft. This might reflect that they increase the strain in times of crisis and food insecurity (Agnew 2012). Personal theft is less likely because personal items are more difficult to sell during such times. This can be explained by the observation that crops can be more easily stolen i.e. from remote fields and that they are

more attractive targets. Finally, also inequality is highly correlated with agricultural theft but not with personal theft. This might indicate that people steal food and livestock products out of need. In fact, de Courson and Nettle (2021) show that individuals who are close to the desperation threshold behave optimally if they exploit others.

With respect to personal theft (i.e. transport), there is a stronger association with the variables education, marital status, assets per capita, the share of household members with wage employment, trust and mobile phones. These variables represent suitable target and guardianship characteristics alike and they indicate that especially better-off households are more likely to be affected.

For crime in general, it is interesting to note that the assets per capita and assets per capita squared turn out to be both statistically significant. This suggests that there exists a non-linear relationship between assets and crime victimization which means that the likelihood of victimization increases with increasing assets but at a diminishing rate. The result is consistent with findings from Barslund et al. (2007).

5. Summary and Conclusion

Crime victimization is known to have multiple negative effects on the rural population. Thus, preventing crime is expected to have a number of positive results. We have used the routine activity approach to identify the determinants of farm crime victimization in Southeast Asia. We have raised two research questions: (1) To what extent are rural people in Thailand and Vietnam affected by crime? And (2) what factors determine rural crime victimization? We have used a panel dataset of 3.536 households in 2016 and 3.573 households in 2017 from Southeast Asia, namely Thailand and Vietnam, and find that 5.46% of the rural households have been victimized over 12 months, some of them even more than once. Most crimes relate to theft. Nevertheless, a large share of households does not take any security measures. Based on different logit models, we find that living in a rural region with higher levels of inequality increases the likelihood of victimization. Households with higher levels of crop commercialization are more likely to suffer from crime. Establishing a good relationship with neighbors plays a role in decreasing the risks of personal theft. Households with less livestock but a higher number of livestock species are more likely to suffer from agricultural theft. Being a young and single household head also increases the danger of crime victimization. Moreover, past victimization and exposure to weather shocks are positively associated with the likelihood of suffering from theft.

We conclude that the routine activity approach helps to identify determinants of victimization. It provides a solid rationale for why we use certain variables and how they are functionally related to crime victimization. However, this approach is also not free from ambiguities, since certain determinants may be associated not just with one dimension of the routine activity approach. For example, age, education of the household head or mobile phones can be linked to the characteristics of suitable targets but also to guardianship.

We also find that crime and theft affect household consumption and child health in rural Thailand and Vietnam. This finding confirms that affected households in the rural areas are prone to food insecurity and that crime is an important determinant of welfare that comes with enormous costs.

Our research leads to some concrete policy recommendations: First, we can derive that guardianship and the use of security and precautionary measures should be promoted since a high share of people do nothing to protect their property. Second, we find that social networks and calling on support from the neighbors are useful in avoiding crime. Third, in times of weather shocks, more guardianship needs to be taken by owners or the police. Fourth, creating more equal chances in the villages and targeted programs to reduce inequality and ensure food security help to avoid crime. Finally, preventing insecurity and crime is a means to increase sustainable development and important investments in public infrastructure and services such as schooling and health care in the rural regions.

There are also some further research needs. Thus, it would be good to know what type of livestock or crops are stolen at what time since some aspects of suitable targets and guardianships may be specific to the product and may also change over time. Felson and Clarke (1998) referred to the "life cycle of goods" meaning that a product is particularly hot, if it is a novelty, but that the market is saturated sometime. Generally, theft of crops is likely to increase in certain months (i.e. during harvesting season) or when it can be more easily disposed of (Holmes and Jones 2017; Bunei et al. 2013). Moreto and Lemieux (2015) add that the attractiveness of the target at the time of the offence is to be judged differently than at later times, e.g. when the stolen goods are processed, transported or trafficked. Knowing the detailed time of victimization would thus help to take specific precautionary measures and thus prevent crime to happen.

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Figure 1. The routine activity approach

Source: Based on Cohen and Felson (1979).

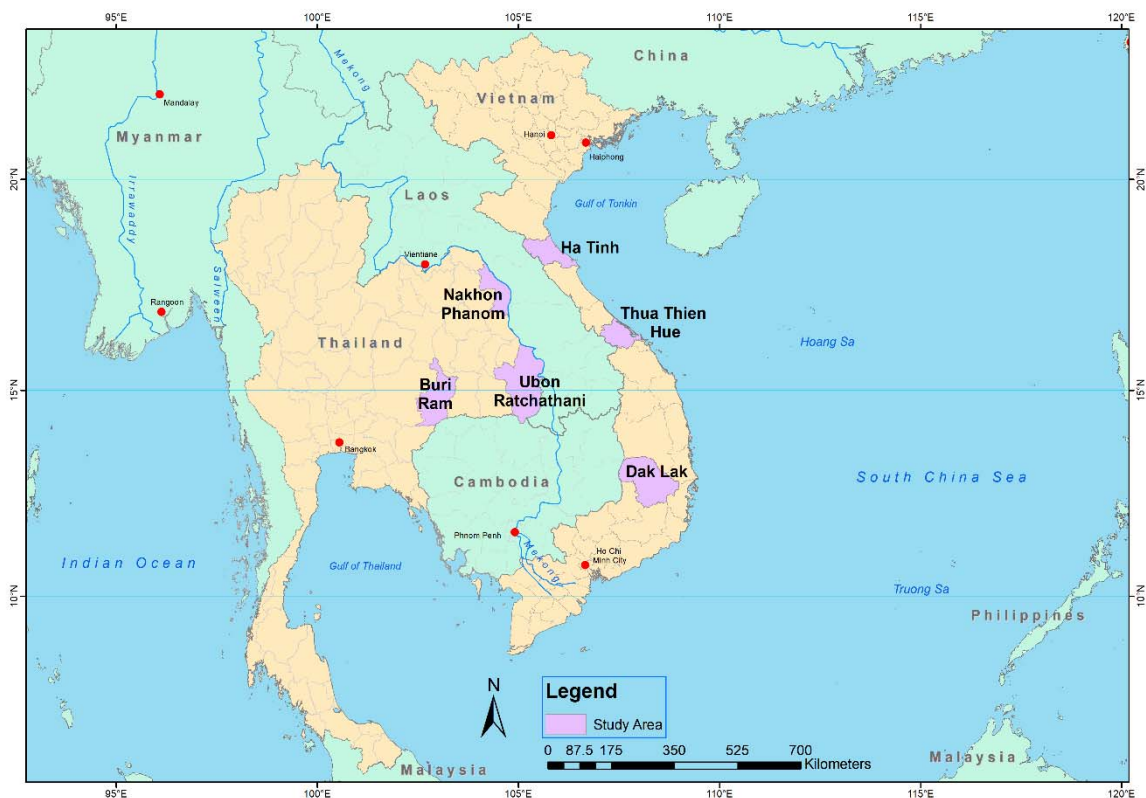


Figure 2. Study areas in Southeast Asia

Source: TVSEP

Table 1: List of variables used from the routine activity approach

Level	Variables	Suitable target	Guardianship	Other	Literature
Individual	<i>age</i>	✓ (-/+)			Fajnzylber et al. 2000; Meier & Miethe 1993; van Kesteren et al. 2014; Clinard & Abbot 1973; Bunei 2014; Farrington 1986
	<i>education</i>	✓ (-/0/+)			van Kesteren et al. 2014; Clinard & Abbot 1973; Soares 2004; Gaviria & Pagés 2002; Fajnzylber et al. 2000; Ehrlich 1973
	<i>marital status</i>	✓ (+)			Fajnzylber et al. 2000; Meier & Miethe 1993; van Kesteren et al. 2014; Clinard & Abbot 1973
	<i>farmland p.c.</i>	✓ (+)			Bunei et al. 2013
	<i>assets p.c.</i>	✓ (+)			Pradhan and Ravallion 1999; Barslund et al. 2007
	<i>assets p.c. sq.</i>	✓ (+)			Barslund et al. 2007
Household	<i>TLU</i>	✓ (+)			McCall 2003; Mears et al. 2007b; Anderson & McCall 2005; Khoabane & Black 2012
	<i>livestock species</i>	✓ (+)			McCall 2003; Mears et al. 2007b; Anderson & McCall 2005; Khoabane & Black 2012
	<i>motorcycle</i>	✓ (+)			Barslund et al. 2007
	<i>past victimization</i>	✓ (+)			Wittebrood & Nieuwbeerta 2000; Dolliver et al. 2022
	<i>health shocks</i>	✓ (-/+)			Chalfin et al. 2019, Azimi & Daigle 2021
	<i>weather shocks</i>	✓ (+)			Blakeslee & Fishman 2017; Yu et al. 2017; Dolliver et al. 2022
	<i>hhszize</i>		✓ (+)		Fajnzylber et al. 2000; Barslund et al. 2007
	<i>maleadults</i>		✓ (+)		Fajnzylber et al. 2000
	<i>wage employment</i>		✓ (+)		Fajnzylber et al. 2000; Meier & Miethe 1993
	<i>trust</i>		✓ (+)		Bursik & Grasmick 1993
	<i>HCI</i>		✓ (+)		Omiti et al. 2006
	<i>mobile phones</i>		✓ (+)		Bursik & Grasmick 1993
	<i>distance plots</i>		✓ (+)		Donnermeyer et al. 2011; Brantingham & Brantingham 1981; Barclay et al. 2001
	<i>land plots</i>		✓ (+)		Donnermeyer et al. 2011
Village	<i>paved road</i>		✓ (+)		van Dijk 2008; Anderson & McCall 2005; Barclay & Donnermeyer 2011; Ganpat et al. 2016
	<i>dist_market</i>		✓ (-)		Donnermeyer et al. 2011
	<i>dist_police</i>		✓ (-)		Fafchamps & Moser 2003; Fajnzylber et al. 2002
	<i>unemployment</i>		✓ (-)		UNODC 2018; Burdett et al. 2003; Buonanno 2003; D'Alessio et al. 2012
District	<i>inequality</i>			✓ (+)	Bourguignon 2000; Demombynes & Özler 2005; Soares 2004; Barslund et al. 2007; Burdett et al. 2003; Buonanno 2003; Kelly 2000; Pradhan & Ravallion 1999
Province	<i>Province dummy</i>			✓	
	<i>Year dummy</i>			✓	

Note: The individual, household and district variables are grouped as belonging to one of the two categories of the routine activity approach (suitable targets or guardianship). In addition, there are three other control variables. The expected sign of the variables is given in parenthesis (+/0/-) denote a positive/no/negative effect. The different sources of the literature are provided in the last row.

Table 2. Definition and descriptives of variables

Variable	Description of variable	Mean	sd
<i>Suitable target T</i>			
<i>age</i>	Age of household head in years	58.61	12.52
<i>education</i>	Highest education level of household members in school years	9.81	3.89
<i>marital status</i>	Household head is married (1=yes)	0.78	0.42
<i>farmland p.c.</i>	farm land area per capita (hectare)	0.33	0.49
<i>TLU</i>	No. of tropical livestock units	1.19	2.17
<i>livestock species</i>	No. of different livestock species	1.39	1.28
<i>assets p.c.</i>	Asset value per capita in 2005 PPP USD	2,042	12.52
<i>assets p.c. sq.</i>	Assets per capita squared	19,272,012	113,244,720
<i>motorcycle</i>	No. of motorcycles of household members	0.86	0.36
<i>past victimization</i>	Household victimized in the past (1=yes)	0.14	0.41
<i>health shocks</i>	No. of health shocks suffered by the households during the last 12 months	0.16	0.39
<i>weather shocks</i>	No. of weather shocks suffered by the households during the last 12 months	0.23	0.46
<i>Guardianship G</i>			
<i>hhsiz</i>	No. of household members	3.71	1.65
<i>maleadults</i>	Share of male adults in household size	0.31	0.23
<i>wage employment</i>	Share of household members with main occupation being wage employment	0.13	0.22
<i>trust</i>	Trust in other villagers measured from 1 (not at all) to 5 (complete trust)	0.82	0.38
<i>HCI</i>	Household Commercialization Index (crop sales to production ratio)	0.42	0.38
<i>mobile phones</i>	No. of mobile phones of household members	1.31	0.57
<i>distance plots</i>	Average distance to plots	1.56	6.92
<i>land plots</i>	No. of plots of household	3.48	2.23
<i>paved road</i>	Nearby road is paved (1=yes)	0.91	0.28
<i>dist_market⁺</i>	Distance to the nearest market in km	6.35	7.16
<i>dist_police⁺</i>	Distance to the nearest police station in km	9.37	8.00
<i>unemployment⁺</i>	Unemployment is a problem in the village (1=yes)	0.43	0.49
<i>Other control variables O</i>			
<i>inequality⁺⁺</i>	Gini consumption inequality index in the district	0.37	0.06

Note: ⁺ data at the village level; ⁺⁺ data at the district level; sd: standard deviation

Table 3. Types, frequency, severity and reporting of crime (both in Thailand and Vietnam), 2016-17

	Number of victimized households ¹	Incidence ² (mean)	Severity ³ (mean)	Damage (in PPP\$ 2005)	Reporting (mean, 1=yes, 0=no)
Theft victimization					
<i>Theft of agricultural products</i>					
Theft of livestock	107	1.00	2.74	152.85	0.35
Theft of crops or agricultural products	44	1.00	2.91	505.00	0.36
<i>Theft of personal items</i>					
Theft of transportation	28	1.04	3.18	1,934.56	0.64
Theft of other items	25	1.00	2.80	557.36	0.28
Burglary	55	1.02	2.93	681.26	0.42
Other types of victimization					
Being cheated at work/business	84	1.02	3.46	4,011.44	0.23
Conflict with neighbors	42	1.02	2.63	658.83	0.62
Robbery	7	1.00	3.00	981.20	0.71
Vandalism	20	1.00	3.15	506.03	0.60

¹ Of all 388 victimized households (or 5.46%), 365 households have been affected by one type of crime, 22 by two types of crimes and 1 households by three types.

² Incidence indicates repeated victimization; if mean is >1, some households have been victimized more than once.

³ Severity of the event (1: no impact, 2: low, 3: medium, 4: high).

Table 4. Determinants of theft victimization in rural Southeast Asia

	Random-Effects Logit		Firth Logit		multilevel logit model (2 levels: household and village)	
	Without past victimization (1)	With past victimization (2)	Without past victimization (3)	With past victimization (4)	Without past victimization (5)	With past victimization (6)
age	-0.0003* (0.0002)	-0.0003 (0.0002)	-0.0098 (0.0060)	-0.0090 (0.0061)	-0.0003* (0.0002)	-0.0003 (0.0002)
education	-0.0012* (0.0007)	-0.0014* (0.0007)	-0.0332 (0.0214)	-0.0370* (0.0217)	-0.0013* (0.0007)	-0.0015** (0.0007)
marital status	-0.0118** (0.0055)	-0.0127** (0.0057)	-0.3502** (0.1650)	-0.3592** (0.1670)	-0.0114** (0.0055)	-0.0123** (0.0058)
farmland p.c.	0.0050 (0.0043)	0.0050 (0.0045)	0.1555 (0.1314)	0.1515 (0.1329)	0.0051 (0.0046)	0.0055 (0.0048)
TLU	-0.0054** (0.0021)	-0.0056** (0.0022)	-0.1584*** (0.0557)	-0.1570*** (0.0560)	-0.0054** (0.0021)	-0.0056** (0.0022)
livestock species	0.0049** (0.0021)	0.0048** (0.0022)	0.1446** (0.0626)	0.1359** (0.0637)	0.0051** (0.0022)	0.0050** (0.0023)
assets p.c.	0.0000* (0.0000)	0.0000* (0.0000)	0.0000 (0.0000)	0.0000 (0.0000)	0.0000 (0.0000)	0.0000 (0.0000)
assets p.c. sq.	-0.0000 (0.0000)	-0.0000 (0.0000)	-0.0000 (0.0000)	-0.0000 (0.0000)	-0.0000 (0.0000)	-0.0000 (0.0000)
motorcycle	0.0010 (0.0074)	0.0022 (0.0078)	0.0184 (0.2209)	0.0522 (0.2239)	0.0017 (0.0072)	0.0029 (0.0076)
past victimization		0.0099** (0.0041)		0.2868** (0.1257)		0.0092** (0.0041)
health shocks	0.0053 (0.0050)	0.0044 (0.0054)	0.1606 (0.1503)	0.1303 (0.1536)	0.0048 (0.0051)	0.0040 (0.0055)
weather shocks	0.0140*** (0.0043)	0.0148*** (0.0045)	0.4206*** (0.1211)	0.4260*** (0.1213)	0.0134*** (0.0046)	0.0143*** (0.0048)
hhsz	0.0011 (0.0018)	0.0009 (0.0019)	0.0304 (0.0478)	0.0230 (0.0493)	0.0010 (0.0018)	0.0007 (0.0019)
male adults	-0.0000 (0.0109)	0.0025 (0.0117)	-0.0143 (0.3218)	0.0545 (0.3280)	-0.0007 (0.0109)	0.0022 (0.0118)
wage employment	0.0097 (0.0108)	0.0108 (0.0115)	0.3114 (0.3216)	0.3261 (0.3255)	0.0094 (0.0109)	0.0102 (0.0118)
trust	-0.0093* (0.0055)	-0.0087 (0.0058)	-0.2849* (0.1660)	-0.2550 (0.1683)	-0.0090* (0.0053)	-0.0085 (0.0057)
HCI	0.0150** (0.0072)	0.0151** (0.0076)	0.4519** (0.2077)	0.4316** (0.2094)	0.0157** (0.0075)	0.0157** (0.0080)
mobile phones	0.0084* (0.0045)	0.0092* (0.0047)	0.2500* (0.1282)	0.2594** (0.1295)	0.0092* (0.0048)	0.0101** (0.0050)
distance plots	0.0001 (0.0001)	0.0001 (0.0001)	0.0049 (0.0044)	0.0045 (0.0043)	0.0001 (0.0001)	0.0001 (0.0001)
land plots	0.0000 (0.0011)	-0.0003 (0.0011)	-0.0004 (0.0354)	-0.0102 (0.0359)	0.0001 (0.0011)	-0.0003 (0.0012)
paved road	0.0005 (0.0076)	-0.0007 (0.0080)	0.0069 (0.2252)	-0.0276 (0.2264)	0.0005 (0.0088)	-0.0009 (0.0095)
distance market	0.0000 (0.0004)	0.0001 (0.0004)	0.0012 (0.0106)	0.0015 (0.0107)	0.0001 (0.0004)	0.0001 (0.0004)
distance police	-0.0004 (0.0003)	-0.0004 (0.0003)	-0.0114 (0.0089)	-0.0096 (0.0089)	-0.0004 (0.0003)	-0.0004 (0.0003)
unemployment	0.0005 (0.0048)	-0.0003 (0.0050)	0.0134 (0.1394)	-0.0078 (0.1411)	0.0011 (0.0055)	0.0005 (0.0059)
inequality	0.1422*** (0.0377)	0.1412*** (0.0392)	4.3199*** (1.1389)	4.1041*** (1.1502)	0.1351*** (0.0429)	0.1335*** (0.0450)
year and province dummies	yes	yes	yes	yes	yes	yes
N	7109	6651	7109	6651	7109	6651
Prob > Chi ²	0.000	0.000	0.000	0.000	0.000	0.000

*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$; robust standard errors in parentheses

Table 5. Determinants of victimization across different types

Random-Effects Logit								
	Crime in general		Theft in general		Agricultural theft		Personal theft	
	Without past victim. (1)	With past victim. (2)	Without past victim. (1)	With past victim. (2)	Without past victim. (1)	With past victim. (2)	Without past victim. (1)	With past victim. (2)
age	-0.0004 (0.0003)	-0.0003 (0.0003)	-0.0003* (0.0002)	-0.0003 (0.0002)	-0.0002 (0.0001)	-0.0002 (0.0002)	-0.0001 (0.0001)	-0.0001 (0.0001)
education	-0.0015* (0.0009)	-0.0018** (0.0009)	-0.0012* (0.0007)	-0.0014* (0.0007)	-0.0004 (0.0006)	-0.0005 (0.0006)	-0.0008* (0.0004)	-0.0009** (0.0004)
marital status	-0.0145** (0.0072)	-0.0169** (0.0076)	-0.0118** (0.0055)	-0.0127** (0.0057)	-0.0065 (0.0043)	-0.0059 (0.0045)	-0.0056* (0.0034)	-0.0073** (0.0035)
farmland p.c.	0.0010 (0.0062)	0.0014 (0.0065)	0.0050 (0.0043)	0.0050 (0.0045)	0.0051* (0.0029)	0.0053* (0.0030)	0.0005 (0.0031)	0.0005 (0.0033)
TLU	-0.0048* (0.0025)	-0.0049* (0.0025)	-0.0054** (0.0021)	-0.0056** (0.0022)	-0.0033* (0.0018)	-0.0035* (0.0019)	-0.0020* (0.0012)	-0.0021* (0.0012)
livestock species	0.0063** (0.0028)	0.0068** (0.0029)	0.0049** (0.0021)	0.0048** (0.0022)	0.0042*** (0.0015)	0.0041*** (0.0016)	0.0005 (0.0016)	0.0006 (0.0017)
assets p.c.	0.0000*** (0.0000)	0.0000*** (0.0000)	0.0000* (0.0000)	0.0000* (0.0000)	-0.0000 (0.0000)	-0.0000 (0.0000)	0.0000** (0.0000)	0.0000** (0.0000)
assets p.c. sq.	-0.0000* (0.0000)	-0.0000* (0.0000)	-0.0000 (0.0000)	-0.0000 (0.0000)	-0.0000 (0.0000)	-0.0000 (0.0000)	-0.0000 (0.0000)	-0.0000 (0.0000)
motorcycle	0.0074 (0.0097)	0.0086 (0.0102)	0.0010 (0.0074)	0.0022 (0.0078)	0.0019 (0.0058)	0.0024 (0.0060)	-0.0001 (0.0044)	0.0008 (0.0047)
past victimization		0.0210*** (0.0056)		0.0099** (0.0041)		0.0108*** (0.0028)		-0.0050 (0.0042)
health shocks	0.0032 (0.0063)	0.0029 (0.0066)	0.0053 (0.0050)	0.0044 (0.0054)	0.0027 (0.0036)	0.0023 (0.0039)	0.0023 (0.0034)	0.0019 (0.0037)
weather shocks	0.0141** (0.0055)	0.0152*** (0.0056)	0.0140*** (0.0043)	0.0148*** (0.0045)	0.0131*** (0.0030)	0.0137*** (0.0031)	-0.0010 (0.0035)	-0.0009 (0.0036)
hhsz	0.0025 (0.0021)	0.0027 (0.0022)	0.0011 (0.0018)	0.0009 (0.0019)	0.0005 (0.0014)	0.0002 (0.0015)	0.0006 (0.0011)	0.0007 (0.0012)
male adults	0.0104 (0.0135)	0.0157 (0.0145)	-0.0000 (0.0109)	0.0025 (0.0117)	0.0016 (0.0090)	0.0021 (0.0098)	-0.0007 (0.0063)	0.0015 (0.0068)
wage employment	0.0033 (0.0136)	0.0092 (0.0143)	0.0097 (0.0108)	0.0108 (0.0115)	-0.0041 (0.0093)	-0.0040 (0.0099)	0.0115* (0.0064)	0.0128* (0.0068)
trust	-0.0174*** (0.0068)	-0.0152** (0.0071)	-0.0093* (0.0055)	-0.0087 (0.0058)	0.0004 (0.0048)	0.0009 (0.0050)	-0.0082** (0.0033)	-0.0082** (0.0035)
HCI	0.0110 (0.0089)	0.0101 (0.0093)	0.0150** (0.0072)	0.0151** (0.0076)	0.0093* (0.0055)	0.0090 (0.0059)	0.0060 (0.0047)	0.0065 (0.0049)
mobile phones	0.0040 (0.0054)	0.0045 (0.0057)	0.0084* (0.0045)	0.0092* (0.0047)	0.0005 (0.0033)	0.0003 (0.0035)	0.0078** (0.0031)	0.0088*** (0.0033)
distance plots	0.0001 (0.0002)	0.0001 (0.0002)	0.0001 (0.0001)	0.0001 (0.0001)	0.0001 (0.0001)	0.0001 (0.0001)	0.0000 (0.0001)	0.0000 (0.0001)
land plots	0.0016 (0.0014)	0.0010 (0.0015)	0.0000 (0.0011)	-0.0003 (0.0011)	-0.0003 (0.0008)	-0.0005 (0.0008)	0.0004 (0.0007)	0.0001 (0.0008)
paved road	0.0103 (0.0103)	0.0080 (0.0107)	0.0005 (0.0076)	-0.0007 (0.0080)	-0.0003 (0.0054)	-0.0013 (0.0057)	0.0017 (0.0057)	0.0018 (0.0059)
distance market	-0.0001 (0.0005)	-0.0001 (0.0005)	0.0000 (0.0004)	0.0001 (0.0004)	-0.0001 (0.0003)	-0.0001 (0.0004)	0.0001 (0.0002)	0.0001 (0.0002)
distance police	-0.0003 (0.0003)	-0.0002 (0.0004)	-0.0004 (0.0003)	-0.0004 (0.0003)	-0.0004* (0.0002)	-0.0004 (0.0002)	-0.0000 (0.0002)	-0.0000 (0.0002)
unemployment	0.0102* (0.0059)	0.0088 (0.0061)	0.0005 (0.0048)	-0.0003 (0.0050)	-0.0009 (0.0036)	-0.0021 (0.0039)	0.0012 (0.0031)	0.0017 (0.0033)
inequality	0.1534*** (0.0456)	0.1548*** (0.0475)	0.1422*** (0.0377)	0.1412*** (0.0392)	0.1088*** (0.0281)	0.1012*** (0.0287)	0.0278 (0.0263)	0.0336 (0.0281)
year and province dummies	yes	yes	yes	yes	yes	yes	yes	yes
N	7109	6651	7109	6651	7109	6651	7109	6651
Prob > Chi ²	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$; standard deviation in parentheses

Appendix A. Multicollinearity test for determinants models

Name	VIF
age	1.32
education	1.58
marital status	1.18
farmland p.c.	1.57
TLU	1.35
livestock species	1.63
assets p.c.	4.26
assets p.c. sq.	3.78
motorcycle	1.43
past victimization	1.04
health shocks	1.03
weather shocks	1.06
hysize	1.52
male adults	1.25
wage employment	1.17
trust	1.04
HCI	1.50
mobile phones	1.26
distance plots	1.02
land plots	1.66
paved road	1.16
distance market	1.41
distance police	1.11
unemployment	1.13
inequality	1.12
year	1.04
province1	2.61
province2	2.53
province3	1.76
province4	2.64
province5	2.00
Mean	1.62

Appendix B. Type and Frequency of Victimization (Thailand and Vietnam), 2016-17

	No. of reported cases		Incidence (mean)		Severity* (mean)		Damage (in PPP\$ 2005)		Reporting (mean, 1=yes, 0=no)	
	TH	VN	TH	VN	TH	VN	TH	VN	TH	VN
Theft of livestock	31	76	1.00	1.00	2.55	2.82	156	152	0.35	0.34
Theft of crops or agri. products	12	32	1.00	1.00	2.33	3.13	264	595	0.58	0.28
Theft of transportation	13	15	1.00	1.07	3.15	3.20	2258	1654	0.85	0.47
Theft other items	13	12	1.00	1.00	2.46	3.17	333	800	0.31	0.25
Burglary	29	26	1.03	1.00	3.00	2.85	644	723	0.41	0.42
Being cheated at work/business	47	37	1.00	1.05	3.49	3.42	3073	5203	0.13	0.35
Conflict with neighbors	16	26	1.00	1.04	2.38	2.79	782	583	0.56	0.65
Robbery	5	2	1.00	1.00	2.80	3.50	1250	310	0.80	0.50
Vandalism	0	20	-	1.00	-	3.15	-	506.03	-	0.60
	166	246								

Note: *Severity of the event (1: no impact, 2: low, 3: medium, 4: high); TH = Thailand; VN = Vietnam

Appendix C. Security measures taken up by rural households, 2016 and 2017

	Whole sample	Thailand	Vietnam
Do nothing (%)	70.07	89.71	49.33
Investment in security of homestead (%)	3.74	0.53	7.37
Lighting (%)	0.25	0.08	0.45
Locks (%)	13.80	5.20	23.51
Alarm system (%)	0.52	0.21	0.87
Guard (%)	2.56	0.05	5.39
Watchdog (%)	7.03	2.79	11.83
Investment in social capital (networks, associations, gifts) (%)	9.62	0.08	20.40
Neighborhood watch (%)	3.50	1.64	5.60
No. of observations	7109	3770	3339

Note: Sum of the share of prevention strategies is not equal to 100% as some households use multiple preventive strategies against multiple types of crimes.

Appendix D. Determinants of agricultural theft victimization in rural Southeast Asia

	Random-Effects Logit		Firth Logit		multilevel logit model (2 levels: household and village)	
	Without past victimization (1)	With past victimization (2)	Without past victimization (3)	With past victimization (4)	Without past victimization (5)	With past victimization (6)
age	-0.0002 (0.0001)	-0.0002 (0.0002)	-0.0082 (0.0077)	-0.0071 (0.0079)	-0.0002 (0.0001)	-0.0002 (0.0002)
education	-0.0004 (0.0006)	-0.0005 (0.0006)	-0.0158 (0.0282)	-0.0196 (0.0287)	-0.0004 (0.0006)	-0.0005 (0.0006)
marital status	-0.0065 (0.0043)	-0.0059 (0.0045)	-0.3273 (0.2126)	-0.2890 (0.2159)	-0.0064 (0.0043)	-0.0059 (0.0045)
farmland p.c.	0.0051* (0.0029)	0.0053* (0.0030)	0.2609* (0.1553)	0.2644* (0.1583)	0.0051* (0.0029)	0.0056* (0.0031)
TLU	-0.0033* (0.0018)	-0.0035* (0.0019)	-0.1564** (0.0717)	-0.1552** (0.0722)	-0.0032* (0.0018)	-0.0033* (0.0019)
livestock species	0.0042*** (0.0015)	0.0041*** (0.0016)	0.2020*** (0.0765)	0.1895** (0.0781)	0.0043*** (0.0015)	0.0043*** (0.0016)
assets p.c.	-0.0000 (0.0000)	-0.0000 (0.0000)	-0.0000 (0.0000)	-0.0000 (0.0000)	-0.0000 (0.0000)	-0.0000 (0.0000)
assets p.c. sq.	-0.0000 (0.0000)	-0.0000 (0.0000)	0.0000 (0.0000)	0.0000 (0.0000)	-0.0000 (0.0000)	-0.0000 (0.0000)
motorcycle	0.0019 (0.0058)	0.0024 (0.0060)	0.0832 (0.2773)	0.1032 (0.2786)	0.0024 (0.0056)	0.0027 (0.0058)
past victimization		0.0108*** (0.0028)		0.5050*** (0.1374)		0.0105*** (0.0027)
health shocks	0.0027 (0.0036)	0.0023 (0.0039)	0.1465 (0.1902)	0.1228 (0.1946)	0.0027 (0.0036)	0.0023 (0.0039)
weather shocks	0.0131*** (0.0030)	0.0137*** (0.0031)	0.6444*** (0.1413)	0.6435*** (0.1416)	0.0129*** (0.0031)	0.0136*** (0.0032)
hhsize	0.0005 (0.0014)	0.0002 (0.0015)	0.0180 (0.0613)	0.0051 (0.0635)	0.0003 (0.0015)	-0.0000 (0.0016)
male adults	0.0016 (0.0090)	0.0021 (0.0098)	0.0553 (0.4145)	0.0838 (0.4250)	0.0004 (0.0091)	0.0013 (0.0100)
wage employment	-0.0041 (0.0093)	-0.0040 (0.0099)	-0.1600 (0.4555)	-0.1563 (0.4626)	-0.0041 (0.0089)	-0.0046 (0.0095)
trust	0.0004 (0.0048)	0.0009 (0.0050)	0.0040 (0.2360)	0.0291 (0.2380)	0.0007 (0.0048)	0.0013 (0.0051)
HCI	0.0093* (0.0055)	0.0090 (0.0059)	0.4512* (0.2679)	0.4151 (0.2712)	0.0098* (0.0058)	0.0097 (0.0061)
mobile phones	0.0005 (0.0033)	0.0003 (0.0035)	0.0300 (0.1653)	0.0142 (0.1667)	0.0010 (0.0036)	0.0008 (0.0037)
distance plots	0.0001 (0.0001)	0.0001 (0.0001)	0.0061 (0.0047)	0.0053 (0.0046)	0.0001 (0.0001)	0.0001 (0.0001)
land plots	-0.0003 (0.0008)	-0.0005 (0.0008)	-0.0165 (0.0452)	-0.0232 (0.0453)	-0.0002 (0.0008)	-0.0004 (0.0009)
paved road	-0.0003 (0.0054)	-0.0013 (0.0057)	-0.0265 (0.2704)	-0.0724 (0.2723)	0.0002 (0.0067)	-0.0007 (0.0072)
distance market	-0.0001 (0.0003)	-0.0001 (0.0004)	-0.0064 (0.0147)	-0.0054 (0.0148)	-0.0001 (0.0003)	-0.0001 (0.0003)
distance police	-0.0004* (0.0002)	-0.0004 (0.0002)	-0.0191 (0.0119)	-0.0160 (0.0118)	-0.0004* (0.0003)	-0.0004 (0.0003)
unemployment	-0.0009 (0.0036)	-0.0021 (0.0039)	-0.0468 (0.1800)	-0.1028 (0.1827)	-0.0005 (0.0041)	-0.0017 (0.0044)
inequality	0.1088*** (0.0281)	0.1012*** (0.0287)	5.4471*** (1.4537)	4.8613*** (1.4683)	0.1036*** (0.0300)	0.0951*** (0.0306)
year and province dummies	yes	yes	yes	yes	yes	yes
N	7109	6651	7109	6651	7109	6651
Prob > Chi ²	0.000	0.000	0.000	0.000	0.000	0.000

*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$; robust standard errors in parentheses

Appendix E. Determinants of personal theft victimization in rural Southeast Asia

	Random-Effects Logit		Firth Logit		multilevel logit model (2 levels: household and village)	
	Without past victimization (1)	With past victimization (2)	Without past victimization (3)	With past victimization (4)	Without past victimization (5)	With past victimization (6)
age	-0.0001 (0.0001)	-0.0001 (0.0001)	-0.0102 (0.0094)	-0.0098 (0.0095)	-0.0001 (0.0001)	-0.0001 (0.0001)
education	-0.0008* (0.0004)	-0.0009** (0.0004)	-0.0535* (0.0319)	-0.0588* (0.0325)	-0.0008* (0.0004)	-0.0009** (0.0005)
married head	-0.0056* (0.0034)	-0.0073** (0.0035)	-0.3827 (0.2526)	-0.4746* (0.2550)	-0.0052 (0.0036)	-0.0069* (0.0037)
farm land p.c.	0.0005 (0.0031)	0.0005 (0.0033)	0.0613 (0.2079)	0.0559 (0.2072)	0.0004 (0.0032)	0.0004 (0.0033)
TLU	-0.0020* (0.0012)	-0.0021* (0.0012)	-0.1310 (0.0869)	-0.1314 (0.0863)	-0.0021* (0.0012)	-0.0022* (0.0013)
livestock species	0.0005 (0.0016)	0.0006 (0.0017)	0.0330 (0.1063)	0.0378 (0.1075)	0.0006 (0.0016)	0.0007 (0.0017)
assets p.c.	0.0000** (0.0000)	0.0000** (0.0000)	0.0001** (0.0000)	0.0001** (0.0000)	0.0000** (0.0000)	0.0000** (0.0000)
assets p.c. sq.	-0.0000 (0.0000)	-0.0000 (0.0000)	-0.0000 (0.0000)	-0.0000 (0.0000)	-0.0000 (0.0000)	-0.0000 (0.0000)
motorcycle	-0.0001 (0.0044)	0.0008 (0.0047)	-0.0623 (0.3545)	-0.0023 (0.3654)	-0.0003 (0.0043)	0.0006 (0.0048)
past victimization		-0.0050 (0.0042)		-0.2940 (0.2924)		-0.0055 (0.0042)
health shocks	0.0023 (0.0034)	0.0019 (0.0037)	0.1902 (0.2364)	0.1598 (0.2408)	0.0020 (0.0036)	0.0016 (0.0039)
weather shocks	-0.0010 (0.0035)	-0.0009 (0.0036)	-0.0508 (0.2260)	-0.0371 (0.2259)	-0.0012 (0.0036)	-0.0011 (0.0037)
hhsz	0.0006 (0.0011)	0.0007 (0.0012)	0.0381 (0.0748)	0.0415 (0.0767)	0.0008 (0.0011)	0.0008 (0.0012)
male adults	-0.0007 (0.0063)	0.0015 (0.0068)	-0.0770 (0.4965)	0.0660 (0.5057)	-0.0002 (0.0064)	0.0019 (0.0069)
wage employment	0.0115* (0.0064)	0.0128* (0.0068)	0.8825** (0.4428)	0.9311** (0.4479)	0.0114* (0.0063)	0.0126* (0.0068)
trust	-0.0082** (0.0033)	-0.0082** (0.0035)	-0.6045*** (0.2307)	-0.5776** (0.2345)	-0.0084*** (0.0030)	-0.0085*** (0.0033)
HCI	0.0060 (0.0047)	0.0065 (0.0049)	0.4260 (0.3225)	0.4410 (0.3231)	0.0063 (0.0050)	0.0067 (0.0052)
mobile phones	0.0078** (0.0031)	0.0088*** (0.0033)	0.5802*** (0.2009)	0.6224*** (0.2037)	0.0080** (0.0034)	0.0091** (0.0037)
distance plots	0.0000 (0.0001)	0.0000 (0.0001)	0.0069 (0.0051)	0.0074 (0.0051)	0.0000 (0.0001)	0.0000 (0.0001)
land plots	0.0004 (0.0007)	0.0001 (0.0008)	0.0255 (0.0554)	0.0088 (0.0577)	0.0003 (0.0008)	0.0001 (0.0009)
paved road	0.0017 (0.0057)	0.0018 (0.0059)	0.0835 (0.3877)	0.0799 (0.3883)	0.0017 (0.0060)	0.0016 (0.0065)
distance market	0.0001 (0.0002)	0.0001 (0.0002)	0.0124 (0.0154)	0.0114 (0.0155)	0.0002 (0.0002)	0.0001 (0.0002)
distance police	-0.0000 (0.0002)	-0.0000 (0.0002)	0.0015 (0.0132)	0.0018 (0.0132)	0.0000 (0.0002)	0.0000 (0.0002)
unemployment	0.0012 (0.0031)	0.0017 (0.0033)	0.0898 (0.2143)	0.1238 (0.2161)	0.0010 (0.0033)	0.0015 (0.0035)
inequality	0.0278 (0.0263)	0.0336 (0.0281)	1.9800 (1.8070)	2.2766 (1.8311)	0.0309 (0.0269)	0.0374 (0.0291)
year and province dummies	yes	yes	yes	yes	yes	yes
N	7109	6651	7109	6651	7109	6651
Prob > Chi ²	0.000	0.000	0.000	0.000	0.000	0.000

*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$; robust standard errors in parentheses