Organised vehicle crime in Europe

Six country case studies on organised vehicle crime and potential barriers to prevent the facilitation of online distribution of stolen vehicles and vehicle parts
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Report of 6 country case studies on organised vehicle crime and potential barriers to prevent the facilitation of online distribution of stolen vehicles and vehicle parts

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Introduction

Ever since 2011, organised property crime is considered to be a significant criminal market by Europol (2011, 2013, 2017) that affects virtually all EU Member States and therefore requires concerted action. Therefore, it is logical that the EU adopted it as a priority in its 2nd EU Policy Cycle. V-BAR focuses on a specific form of organised property crime: motor vehicle crime, which includes motor vehicle theft and the sale of stolen vehicle parts. Over the years there has been an overall decrease in crime. This also translates in a decrease in motor vehicle theft. Both in 2013 and in 2017 the trend of motor vehicle theft seemed stable or declining which is confirmed by Eurostat: in 2018, the number of vehicle thefts dropped by 40 per cent compared to 2008 (Eurostat, 2020) and is confirmed by Europol (2017). However, the overall volume of vehicle theft remains very high. Eurostat (2022) produced two relevant graphs with statistic on motor vehicle theft, presented below.

The drop could indicate professionalisation on the part of organized crime groups involved, or an increase in crime on demand and thus targeted crime. Organized crime groups are increasingly using advanced technologies to defy the current security systems. On top of that, the e-commerce in Europe has grown over the years and keeps on growing (Ecommerce News, 2020). This facilitates organized crime groups, giving them a way to sell and deliver parts of stolen vehicles online (Europol, 2017).

During the last two years, Europol reported on two international operations. Operation Mobile 4 was an international operation between European countries, Europol and Frontex that took place between 11-22 October 2021. 518 Stolen vehicles and 400 stolen vehicle parts were recovered in Eastern European countries through vehicle checks, border searches and database checks. On top of that, several luxury cars from Western Europe were found as well as 4 boats. Raids took place in chop shops. These are places that strip vehicles and sell parts, which resulted in seizures of forged IDs and stolen vehicle parts. A trend could be noted in an increase in smuggling of stolen trucks.
buses, agriculture machinery and holiday cars (Europol 2021a). Operation mobile 5 took place on October 2022 and had some similar results as operation Mobile 4. Approximately 522 stolen cars and various car parts as well as boat engines had been found including chophouses. Analyses of the operation suggests that more and more criminal groups are starting to strip cars and transport parts. This is due to border closures due to COVID-19 requiring adaptability of criminal groups, as well as stripped parts being harder to track down. An increase in motor vehicle theft of rental cars and campers had been noticed (Europol, 2022). In the U.S., there was an increase in motor vehicle theft in 2020. Usually older models are being stolen and brought to chop shops where the cars get stripped. On top of that catalytic converters are being stolen the most hence the precious metals are worth up to 250 dollars (NICB, 2021).

**V-BAR and its objectives**

The current project, V-BAR, builds on already existing initiatives (EMPACT, AP, Project INVEX, EUVID) and mirrors previous developments of barrier models on synthetic drugs and organized crime by Europol’s EMPACT Operational Action Plan, EU Member States, the ENAA and the CCV.

The V-BAR project has set a general objective as well as some specific objectives and a long-term aim. On top of that it sets out to have two major outputs.

The **general objective of V-BAR** is to boost operational cooperation between EU law enforcement authorities and other public and private stakeholders in the field of disrupting and preventing organized vehicle crime committed by mobile organized crime groups.
The specific objectives of V-BAR are:
- To analyse the criminal markets of organized vehicle crime (motor vehicle theft and stolen vehicle parts) in six EU Member States in order to enhance our understanding of the logistical and financial processes of motor vehicle theft and stolen parts.
- To develop a cross-border, European barrier model on organized vehicle crime to analyse and tackle motor vehicle theft and stolen parts.
- To boost strategic and operational cooperation between law enforcement authorities and relevant partners as part of a whole of government approach.

The long-term goal of V-BAR is to contribute to the prevention of the organized vehicle crime by creating effective barriers and increasing cooperation and information sharing between relevant public and private stakeholders, including through a close cooperation with the European Network on the Administrative Approach (ENAA).

Thematic scope and methodology of the logistical process

Focus of the research project

V-BAR focusses on the prevention of motor vehicle theft. Motor vehicle theft can be defined as: “depriving a person or organization of a motor vehicle and/or motor vehicle parts with the intent to sell it for monetary profit” (adapted from the 5th European Sourcebook, p.22). During a methodological workshop with all researchers involved in the V-BAR project, we felt the need for delineation. For this project, the scope of motor vehicle types has been delineated to only include four-wheeled vehicles meant for transportation of people (no motorbikes, trucks, agricultural vehicles,...). The focus of this study is on the theft of catalysts and airbags, as these seem to be a common trend in theft of vehicle parts across countries. On top of that, a special inclusion on electrifications of cars was agreed upon. Both the private sector and the internet/ICT also play a role in the criminal process as well as in the prevention of the theft of motor vehicle parts. Therefore, the project included a minimum number of stakeholders from the private sector. Finally, the role of the internet/ICT on motor vehicle theft was examined as well.

Process steps

To create a good picture of the national markets of vehicle crime and the cross-border elements which are relevant for the development of a European barrier model, a logistical design was used based on the experiences of the CCV. The identification of logistical process steps can be done through the use of crime scripts. A script is an accurate representation of all the events, procedures and steps criminals undertake to commit a crime. This includes events happening before and after a crime. Based on the universal script, developed by Cornish (1994), crime scripts were made of motor vehicle theft and stolen vehicle parts. The crime scripts were transformed into broader process steps which are shown in the picture below. The country researchers identified opportunities, signals of criminal activities, facilitators and possible partners in each step. Based on this analysis, barriers are proposed in every process step. It is important to mention that based on the findings of the country researches, not all process steps have been identified and some process steps have popped up in one country, but not in another.
1. Opportunities in each process step

Opportunities are matters that make it possible to commit a crime. Within every step, and in between process steps are multiple opportunities to identify. The aim of this research is to eliminate the opportunities within the criminal process. The best way of identifying opportunities is to get in the head of a criminal. The most common categories of opportunities in barrier models are infrastructure, devices & materials, financial & judicial and administrative services, shielding/security/protection and lastly, opportunities unintentionally created by the government.

2. Signals

Criminal activity is usually meant to be invisible, however at any and every step of the process there can be signals. These signals can be identified in cooperation between all parties (police, field experts...). Examples of signals are: financial signals, social signals, logistical signals, physical signs and administrative signs.

3. Network

Researchers have to put themselves into the position of the criminal and try to find persons/parties who can aid in each of the previously described processes, either consciously or unconsciously. Parties from both the legal and illegal world should be included in this network. Facilitators can be found in following sectors (not exhaustive): Real estate, transport and logistics, financial services and government services.

4. Partners/ Stakeholders

The involvement of experts from the relevant organizations is crucial when researchers make a barrier model. Experts can map the process of a criminal organization, while stakeholders have knowledge of their organization and network. Think outside of the box; it may be necessary to find unconventional partners in order to map the complete process. All the discussions between stakeholders, participants and researchers lead to a better understanding of a crime phenomenon and thus a better mapped out phenomenon. These discussions can be both in group or individual.
5. Barriers

The goal of V-BAR is to create a barrier model. Therefore, barriers have to be toolboxes that parties have at their disposal to prevent crime in itself or disrupt/prevent opportunities as much as possible. Cooperation in an integrated approach with all partners is essential to make this happen. Barriers are either preventive or repressive measures. Early interventions lead to more preventive approaches while later interventions have a repressive nature. In the end, stakeholders and partners can decide which barriers are preferable. Examples of barriers are: economic barriers, legal/administrative barriers, informative barriers, and criminal law barriers. The construction of the V-BAR model will be made based on all the data gathered through literature review, media reports, case studies, interviews, and focus groups. The barrier models of each country have to be compatible with each other. To achieve this, V-BAR aims to identify 5-6 process steps and tries to cluster 5-6 barriers for each of the steps.

Data

V-BAR collected its data in six different EU member states, tracking five data sources.
- Media reports to identify trends.
- Desk review.
  - Review of the relevant literature/statistics like victims, offenders, convictions, trends, overview of (il)legal market, impact of the problem.
- 10-15 in-depth interviews with key stakeholders.
  - Researchers decided who they consider to be “key stakeholders”, however a minimal number of stakeholders from the private sector were required.
  - At least one interview per stakeholder.
- Analysis of police/judicial files.
  - Researchers were required to identify significant police cases in order to analyze/identify every step of the process, partners, opportunities, facilitators, and signals.
  - The research team agreed to adopt a time frame of ten years. So the data collection concerning case files could go back ten years in time.
  - The main aim of case file analyses was to identify trends and process steps.
- Focus groups
  - All the previous steps served to identify process steps, opportunities, partners, facilitators, signals, and barriers. The focus group method was included as a mandatory step in each country study to validate the barrier model on the one hand (partners, process steps, opportunities, facilitators, signals, and barriers), but also to come up with additional barriers if possible.
  - The partners and stakeholders identified during the other methods, were selected as participants for the focus groups.

Both the interviews and the focus groups were guided by an interview protocol and informed consent. This is meant to maximize conformity of the data collected for each country.
Detailed methodology per country case study

Belgium

In the first phase, media reports were collected and a literature review conducted to identify recent trends within motor vehicle theft in Belgium. This resulted in the relevant statistics, an overview of the current situation, current trends, the scope of the problem (which parts, which vehicles, which modus operandi,...) the legal and illegal market, a description of the judicial classifications, important stakeholders and workable definitions of the relevant components of this research project.

In the second phase, the important stakeholders identified during the desk review and project methodology workshops were contacted. There is a requirement within this project to include four specific stakeholders: shipment/delivery companies, car insurance companies, car manufacturers and online traders. Interviews were conducted with 24 stakeholders: five experts within different law enforcement agencies (local police, federal police and maritime and river police), five experts within the insurance sector (from private detectives to representatives of Assuralia) and four other experts (PhD student/white hat hacker, shipping company, Car-Pass and TRAXIO). A more comprehensive respondent list can be found in annex 1 of this report. All respondents were interviewed twice: once informally to discuss the project and their possible collaboration and once formally to conduct the official interview. All stakeholders were send the information letter and signed the informed consent form. The official interviews were recorded with permission of the respondents, all of them agreed to the terms and conditions. The experts within law enforcement agencies were interviewed following the interview/focus group protocol, in which the data was instantly put in the data collection formats. By using crime scripting, the logistical process steps were identified. Afterwards the opportunities, signals, facilitators, partners and barriers were discussed within each step. The other experts were interviewed in regards to their respective expertise in a more open-interview format. The law enforcement officers are designated LEA before their respective number in this report, the private sector respondents are designated PS before their respective number (see annex 1).

In the last phase the collected data needed to be verified and prioritized, by analysis of judicial case files and a focus group. Concerning the analysis of the judicial files, three relevant cases were identified during the interviews with LEAs officials. Access to the case files was requested through the respective national procedure but has not been granted. Concerning the focus group, it was decided to only include the law enforcement officials as there is a distrust between LEAs and the private sector. All five LEAs experts were contacted and a date for the focus group was confirmed by all parties. In the day(s) leading up to the event, three experts cancelled for work-related/personal reasons. The focus group took place with two experts from different law enforcement agencies, who validated and prioritized the barriers from all the interviews. The data collected during the focus group followed the interview/focus group protocol and was immediately added to the reporting format.
Bulgaria

The data collection included a review of extant academic and grey literature, publicly available statistics, and in-depth interviews with stakeholders such as law enforcement officers, customs officers, insurance company representatives, notary chamber representatives, and other private entities. The interviews were conducted following the interview protocol developed by Ghent University and were held in May and July 2022. The Bulgarian research team contacted the following stakeholders: the Ministry of Interior (MoI), National Customs Agency (NCA), Insurers, Chamber of Notaries, Used Cars Importers, Locksmiths Association, online traders selling auto parts, and postal companies. Not all contacted stakeholders agreed to participate in the study and therefore declined to nominate experts for interviews. The breakdown of the interviewed stakeholders is as follows:

<table>
<thead>
<tr>
<th>Bulgaria</th>
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<tbody>
<tr>
<td>Government officials</td>
<td>11</td>
</tr>
<tr>
<td>Private actors</td>
<td>6</td>
</tr>
<tr>
<td>TOTAL interviews</td>
<td>16</td>
</tr>
<tr>
<td>TOTAL respondents</td>
<td>17</td>
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The interviews are labelled as follows in order to facilitate citations. The interviews of law enforcement officers are designated as LEO-1 through LEO-10. The interviewed customer officer is referred to as CO-1, while the private actors are referred to as PA-1 through PA-6. The report includes a thorough analysis and summary of all the interviewees’ information. All the respondents have been asked to grant permission for an audio recording. In cases where the respondents declined permission, the interviewers used handwritten notes instead. The main aim of the interviews was to reconstruct the logistical process behind vehicle thefts in Bulgaria and develop a ‘barrier model’ that can facilitate more effective prevention and countering.

Germany

For this study we interviewed four experts from the police at state and federal levels and five experts from the private sector. We sought to include those most knowledgeable and most experienced in this area of expertise and partly used a snowball-sampling technique to identify interviewees. Prior written informed consent was obtained. The interviews were recorded, transcribed, and thematically analyzed. In addition to the expert interviews, we have drawn on statistics from the German association of insurance companies (GDV 2022a, 2022b) and from the Bundeskriminalamt (BKA 2022) as well as on the pertinent literature and other open sources.

France

Most of our statistical analysis were made by the IHEMI (Institute of the high studies of the ministry of the interior) itself, but we needed to use databases produced by partners of the IHEMI. The databases about accused individuals and victims who lodged a complaint to police or gendarmerie services were stored by the ONDRP (National office for delinquency and penal response). Even if

1 The full list of interviewees is provided in the appendix
the ONDRP was merged with the rest of the Institute and with the statistical service of the ministry of the interior (SSMSI), its previous works remain accessible. Concerning the international comparison, we used data provided by Eurostat in free access that sum up the descriptive statistics about major offences recorded by the different police services among Europe.

Other data came from several partners we met during qualitative interviews or thanks to partnerships inside the ministry of the interior. We got the support of the ARGOS, who is in charge of recuperating stolen vehicles in the name of the insurance companies, who gave us data enabling us to identify the most stolen vehicles, vehicle parts, .. At the same time, we got the support of the SSMSI who provided us results of the victimization surveys led in France against vehicle thefts.

Qualitative materials

We have led several interviews with different stakeholders invested in the countering or victims of vehicle thefts. We can divide them in two categories: the first one includes the individuals working within police or gendarmerie services. Two focus groups were produced with such services. One was made with 3 officers of the OCLCO (central office of struggle against organized crime) in the siege of the judiciary police, which OCLCO is part of. The second one was led with the OCLDI (central office of struggle against itinerant delinquency) in the siege of the national gendarmerie, which OCLDI is part of.

Other main stakeholders were the stakeholders working in companies who must deal with vehicle thefts. Some of them are companies who are specialized in the struggle against vehicle thefts or in the research of the theft vehicle. The ARGOS for instance is funded by all major French insurance companies to get back the stolen vehicles, most of the time theft for more than one month. In this case they must be repaid by the insurance and become the property of the insurance companies.

We led an interview with two of its members including its director. The other structure in charge of the recovery of stolen vehicles was Coyote©, a private company offering vehicle tracking solutions for cars and two wheels vehicles owners. If an equipped vehicle is stolen, they have a team of detectives in charge of the recovery of the vehicle. We have finally met a member of the security staff of the company Sixt©, a car rental company who often suffers car embezzlement (never recovered rented vehicles).

All the consents of the pre-cited interviewees have been obtained after e-mail discussions. All necessities for the conformity to General Data Protection Regulation have been fulfilled: all individuals freely accepted to be interviewed with the aim to support our responsibility of the French part of the V-BAR project. These consents were informed as every mail included a description of the V-BAR projects, the identity of the people in charge of the French part of V-BAR project and a description of the qualitative use of the collected information. These interviews were not recorded but exhaustive notes were taken during the interviews. These consents were finally unequivocal as they all led to e-mail exchanges and the choice of a freely chosen meeting place and time.

Even in the private companies, most of the interviewees are active or former policemen or gendarmes. If we consider the interviewees working in private companies, in the little teams where they work (for ARGOS as well as Coyote© and Sixt©), most employees are former policemen and gendarmes. It was also quite easy to get their contacts with the help of their previous colleagues.
Case studies on other bases

Some other case studies we used to support our propositions of new logistical barriers are not issued from our statistics or from the interviews. In these cases, the sources are specified along the document. In some cases, we used massive thefts described in detail in the press and in some others, we used the tests done by the specialized press or by consumers’ associations about the possibilities of theft on different vehicles with different methods. These cases are mostly used to get information about the diversity of methods used by the thefts and the characteristics of the models who achieve to resist these methods and the impact on their theft rates.

Netherlands

Several research methods have been used to ensure that the Dutch barrier model is as complete as possible: a literature study, an analysis of figures and statistics on vehicle theft and theft of automotive parts, interviews, and a focus group. A total of eleven respondents contributed to the Dutch barrier model. Interviews were conducted with nine of them. In addition to the interviews, a focus group was also held in which seven respondents took part. The eleven respondents were largely approached through the Centre for Crime Prevention and Public Safety network in relation to the vehicle security quality mark. The snowball method was then applied: the respondents were asked to pass on the names of others who could potentially be approached to contribute towards the Dutch barrier model for vehicle crime. The respondents were approached by email and asked whether they wanted to be interviewed for the purpose of the Dutch barrier model. They were informed that their contribution would be voluntary and would not be traceable back to them. The researcher took notes during the interviews as they were not recorded. The interview focused on the issue of car theft and theft of automotive parts in the Netherlands.

The eleven respondents are involved in vehicle crime through various roles. The parties consulted included the police, a car manufacturer, insurance representatives, a private investigation agency, a vehicle security company and, finally, respondents employed at the National Intelligence and Expertise Centre for Vehicle Crime who are involved in tackling vehicle crime.

After the interviews, the information was put into a new document and placed under the different sections of the barrier model. A focus group was also held to ensure that the Dutch barrier model is as complete as possible. Before the focus group took place, all information from the interviews was incorporated into a single document and a draft barrier model was produced in Excel. During the focus group, this barrier model was supplemented by examining the steps of the model and the corresponding opportunities, warning signs, facilitators and barriers in two separate groups.
Belgian barrier model case study

Introduction

In 2021, 4,745 vehicles were reported stolen in Belgium which means that the number of vehicle thefts dropped by 88 per cent compared to 2000 and 38 per cent compared to 2018 (Federale Politie, 2022). An analysis of the latest National Safety Plans (2016-2019 and 2022-2025) reveals that motor vehicle crime in itself is not, and has not been, a priority for the Belgian Federal Police but that this type of crime has been added to the broader banner of property crime, which is a priority in both safety plans. A noticeable distinction between both plans is the shift from property crime in general to organized property crime and the indication that Mobile Organized Crime Groups (MOCG’s) are responsible for the majority of property crimes in Belgium (Geïntegreerde Politie, 2016; 2022). The impact of motor vehicle crime on the country thus shifts from individual harms to a more organized and collective impact on Belgian society.

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<tr>
<td>National</td>
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<td>10,889</td>
<td>10,610</td>
<td>10,155</td>
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Figure 4: Number of motor vehicle thefts in Belgium (national and regional) between 2000-2021. (Federale Politie, 2021)

The heatmap of motor vehicle theft in Belgium shows little variation over time with most thefts concentrated in Henegouwen/Hainaut, more specifically in Charleroi, and the capital of Brussels. Criminals seem to prefer either big cities (Charleroi, Liège, Brussels, Antwerp) or border areas.
Henegouwen - France, Antwerp and Limburg - The Netherlands and Liège – Germany). The heatmaps stay consistent from 2013 until 2020, 2021 seems to be an outlier. Motor vehicle theft hotspots like Charleroi and Tournai (Henegouwen) disappear and thefts are more concentrated in Brussels and Liège. There are no clear indications on why this shift occurred, vehicle theft has not drastically declined in 2021. Police sources provided two possible explanations for this disparity; that either COVID-19 has had an impact on motor vehicle theft hotspots or the police data on hotspots from that time period might be unreliable due to issues with police input. Concerning COVID-19, this explanation seems unlikely as there is no deviation within the 2020 heatmap. It is important to include possible shifts in hotspots but as the reliability of the 2021 heatmap data is not guaranteed, other information sources need to be incorporated before conclusions can be made.

Excluding the heatmap of 2021, data on motor vehicle theft in Belgium is quite reliable as this type of crime seems to (mostly) defy the general pitfall of dark numbers in crime reporting. There are explanations for this trend based on the rational paradigm, which is the idea that people report crimes if the benefits outweigh the costs (Torrente et al., 2016) and thus insurance coverage is an important factor in reporting property crimes (Van Dijk, 2010). Research with regard to comparing
crime data in Europe, concludes that Belgium is generally in the top 5 of reporting on this type of crime (Aebi, 2009). Even though data concerning vehicle theft is reliable, data on the theft of vehicle parts is more complex. This is primarily due to police classifications of the theft of vehicle parts in Belgium which is generally split up in: (1) theft from or to a vehicle and (2) vehicle damage. It is unclear if theft of internal and external vehicle parts are considered to be in category one and/or two, as they can result in vehicle damage too. Both categories are also too broad to include within this research project as (1) can contain personal items being stolen from vehicles i.e. laptops or other valuables and (2) can include all damage to vehicles unrelated to theft. There is little use of reporting on these numbers when they do not provide a clear picture of theft of vehicle parts.

Understanding the phenomena of organized motor vehicle theft in Belgium is made difficult by the absence of scientific research on this topic. Although research on organized crime and mobile organized crime groups is available, the specific application to motor vehicle theft is non-existent. The only information regarding recent trends in motor vehicle theft are provided by newspapers. Various trends are detected in these news articles, going from different modus operandi to specific gangs and targets. With regards to modus operandi, criminal organizations seem to use more modern ICT-related techniques to steal vehicles. Track and tracing, relay and replay attacks, reprogramming car keys and jamming signals are the most commonly cited (Declercq, 2022). Criminals attach track and tracing devices to desired vehicles to follow the target to a secure place. Relay and replay attacks are then used to intercept information between the key fob and the vehicle through a Man-in-the-Middle attack (MitM). By using ICT equipment (i.e. relay attack stations which boost the radio signal if key fobs are not in the immediate vicinity like inside a house), hackers can intercept the signal and transmit it to the station. Once a signal has been transmitted, another station is placed near the car which then relays the message to unlock a vehicle and start it’s engine. Replay attacks are similar, but instead of relaying a signal directly, it will store the intercepted signal from the key fob for later use. Reprogramming of key fobs requires a more sophisticated knowledge of ICT and tends to be a more expensive method. Key fobs are reprogrammed by creating a new key for that then communicates with the OBD port of a car. The reprogramming device is quite expensive but legal to obtain as it is generally used within the automotive sector. The last method is jamming the signal between key fob and vehicle, which keeps car owners from properly locking their vehicle. Once the car owner is out of sight, the thieves are able to open the unlocked doors (Upstream, 2022). Insights in the offenders reveal that mobile organized crime gangs from Eastern European and African countries are the most active in Belgium (Goeman, 2022). Lastly, there are brands that are more vulnerable and in demand specifically: the Land Rover Velar, Landcruisers/ SUV’s from Lexus and Toyota (RAV4), which indicates that luxury brands, relatively new and expensive cars are mostly targeted. There are also noticeable trends in the theft of parts mainly airbags and dashboard consoles from BMW (B.V., 2022). As there is no scientific research available into this phenomena in Belgium, an analysis of the literature in the Netherlands can provide more answers. Research into the phenomena by Ferwerda et al. (2005) and Kuppens et al. (2006) confirms the above information and states similar trends in modus operandi, MOCG’s and targets.

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2 A small handheld remote control device that controls the remote keyless entry (and/or ignition) system, it is used to remotely open or close vehicles.

3 An OBD Port is the universal connector where OBD tools can get plugged in. These tools can tap into a vehicle’s computer and mechanics use these to run tests and get diagnostics. The OBD Port is (usually) located under the steering wheel of vehicles.
Ferwerda et al. (2005) also indicate a prominent role for the private sector within the phenomena of vehicle (parts) theft as the legal car market (online and offline) seems to be particularly vulnerable for criminal infiltration. As vehicles and vehicle parts are not illegal goods in itself, contrary to drugs and arms, the trade is less expected to be criminal in nature and thus less regulated and monitored in Belgium. Not only is the private sector vulnerable for infiltration, it is also prone to experience considerable damage within its (legal) business activities. Examples are the disruption of the legal market, unfair competition, reputational damage, loss of trust from customers et cetera. The private sector can be a partner of law enforcement and government agencies in identifying fraud and crimes and detecting patterns within their respective sectors. A cooperative approach in fighting motor vehicle crime and sharing relevant data between different partners might be necessary to combat and prevent this type of crime. There is, however, an absence of information on which specific private sector partners could or should be involved in the prevention of motor vehicle theft and stolen vehicle parts.

The aim of this research report is to (1) identify the modus operandi, MOCG’s and targets by analysing the logistical criminal process of motor vehicle crime in cooperation with law enforcement agencies (LEAs) and the private sector; (2) identify the relevant partners within the private sector and; (3) create a national barrier model in cooperation with LEAs and the relevant partners within the private sector.

Main findings (for dissemination)

- The shift from property crime committed by individual perpetrators to organized property crime may signal larger societal harms and is therefore being prioritized by the Belgian government and LEAs.
- There is limited information available in regards to the phenomena in Belgium, as motor vehicle theft has- and still is- not been considered to be a priority for LEAs.
- A noticeable trend in motor vehicle theft is the use of ICT-technologies by criminal organizations to steal recently built SUV’s and luxury cars.

Barrier Model

The construction of the national barrier model relies on the data that was collected during the interviews and focus group. Through crime scripting and interviews with experts from different law enforcement agencies\(^4\), the logistical process steps were identified. Afterwards, during the interviews and focus group, the opportunities, signals, facilitators, partners and barriers were discussed within each step. Opportunities are matters that make it possible or easier to commit a crime. Signals are visible signs of criminal activity that can be picked up by different partners. Facilitators are people or organizations that assist criminals, either consciously or unconsciously. Partners are people or organizations that can be used to implement barriers and prevent crime. Barriers are resources, people or organizations that can be used to block opportunities, pick up signals and identify or dismantle criminal networks. Barriers are the toolbox that parties (both public and private) collectively have at their disposal to prevent or counteract crime. The other private sector experts were used to fill in gaps or add to the logistical process. The aim was to cluster five

\(^4\) Local police, Federal police and maritime and river police
barriers for each of the process steps and could include preventive and repressive barriers of administrative or financial nature, for example.

During the interviews the respondents indicated that certain brands are being targeted more by criminals than others in Belgium; Range Rover Velar, Lexus SUV’s and Toyota Land Cruiser. It is interesting to note that the respondents characterize Belgium as both a transit and export country for (stolen) vehicles and vehicles parts. A transit country, in regards to the many ports in Belgium and the easy access to and from other European countries. Belgium is mostly an export country as there are a lot of opportunities for criminals to steal (large amount and wide variety of luxury cars/parts), store (vacancy of firms and storage facilities across the country) and transport (by roads or over sea) vehicles and parts across the national borders. There are also a lot of companies in Belgium that provide their employees with company/commercial vehicles. Most of these cars are leased and at the end of the employees contract their value in Belgium decreases, especially in regard to mileage and the Car-Pass initiative. Older and used cars are more profitable when exported to a country without the Car-Pass initiative, where mileage is not closely monitored. Respondents claim that, even though Belgium is not seen as an import country, there is an increase noticeable concerning American trucks and more exotic cars (7% to 15%). Respondents within the car insurance sector also state that insurance fraud with imported vehicles is on the rise. Criminals purchase German brands in Germany itself at a lower price than their value in Belgium and once imported will insure the car for the Belgium value of the car. When totalled, they gain the difference between the Belgian and German value. According to the respondents, there are three commonly used modus operandi (MO) in motor vehicle theft:

1. **The hit & run MO**, in which criminals from neighbouring countries come into Belgium, steal a vehicle and immediately leave the country. This MO consists of driving the vehicle across the border and not arranging other transport facilities even though this can happen once the vehicle is outside the Belgian border.

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5 Car-Pass is a mandatory document in the second hand car market in Belgium, seller must provide a valid Car-Pass before selling their vehicle. It was introduced in Belgium to prevent and combat mileage fraud but the document also collects other information: the mileage on a vehicle, CO emission certifications, vehicle inspection records and recalls. Vehicle inspection services, car dealerships, car repair shops all register the information with each check-up.
(2) **The Eastern European MO**, in which mobile organized crime gangs (MOCG’s) enter Belgium (either by public transport or a vehicle of their own) and stay for a couple of weeks. These MOCG’s use more sophisticated methods of target identification (track and tracing of ordered cars) and commit multiple thefts (2-4 vehicles) with relay & replay attacks. They transport the stolen vehicles by road (trucks and containers). Most vehicles are transported to Poland, Ukraine, Belarus, Lithuania or Russia (see yellow arrow in Figure 8).

(3) **The Central & South- African MO**, in which the criminal networks already reside within Belgium and steal vehicles and vehicle parts on demand from abroad. These MOCG’s do not have to enter and exit Belgium as they have their base within the country, they use more sophisticated methods of target identification and they too commit multiple thefts per shipment by using ICT tools. The transport of the stolen cars differ in that transport is mostly by roads (to neighbouring EU countries’ ports) or directly to Belgian ports (shipment over sea). These criminal networks within Belgium are mostly Central African (Democratic Republic of Congo, which was colonized by Belgium between 1885 and 1960) and South African (see red arrows in Figure 8).
The three MO’s result in a comprehensive logistical process consisting of seven steps: (1) **entry** (hit & run and Eastern European MO), (2) **stay** (Eastern European), (3) **infrastructure** (all), (4) **crime** (all), (5) **storage** (Eastern European and African MO), (6) **transport & trade** (all) and (7) **profits** (all). The process steps that are being shared by all criminal organizations and MO are indicated in blue in the figure below, the ones shared by Eastern European and African criminals in green and the one in red (entry) is reportedly only being used by the Eastern European MO.

**Figure 8: Map of the Eastern European and Central & South African Modus Operandi in Belgium.**

**Figure 9: Identified process steps of motor vehicle theft in Belgium**
STEP 1: ENTRY

The entry step consists of the way in which foreign criminals enter the country for their criminal activity. This is relevant in both the hit & run and the Eastern European MO, it can be split up in the use of private and public transport. Private transport means the use of their own (family) car or a car provided by the criminal network, public transport means the use of airports, trains and (flix-)busses to reach Belgium as a destination.

There are some very interesting opportunities identified within this first step of the barrier model. First of all, there are some EU-related opportunities:

- Open borders in Schengen Area: no border control in EU, easy and anonymous entry except limited control for airports, limited patrolling by LEAs.
- The elimination of roaming tariffs: easy access to internet and no roaming tariffs in EU which means cheap roaming and no tracing of telephone signals/identity by using VPN’s an encrypted apps on the internet. VPN’s and encryption apps provide anonymous and untraceable communication options for criminals. VPN’s can change the IP-address (and location) used while on the internet and encrypted apps provide a platform for messaging.
- Low cost travel and limited documentation checks.

All above provide safe, cheap and semi-anonymous entry into Belgium. There are also some Belgium (BE)-related opportunities:

- Anonymous travel on public transport: public transport in Belgium does not require accounts or identification.
- Easy and semi-anonymous car rental at entry points: easy access and limited ID control for car rental/leasing at entry points (train stations, bus stations, airport, ports...). ID’s can be forged or straw men can be used.
- Limited and old ANPR-cameras at some border-crossing points, avoiding ANPR is also easy (driving close to big trucks, magnets on license plates with Bluetooth) and old camera’s provide bad quality of data.
- The lack of training and resources for LEAs: LEAs and specifically intervention teams (patrolling teams) have limited time to conduct random traffic stops, they need to be available for urgent calls at all times. LEAs do not have specific courses on vehicle identification which results in a lack of recognition of signals and no diligent controls.

With regard to signals, there are very little signs of criminal activity in this step of the barrier model. As a crime has not been committed, LEAs have little ground to pro-actively search for criminal activity during the border crossing (Schengen Area). The only signals that can be picked up in this phase, is during random traffic stops.

Except for the aid of family and criminal network, most of the facilitators within this step can also be regarded as partners. These partners for LEAs are mostly active within the private sector:

- Telecom companies: can share data with each other and LEA to provide better tracking of mobile signals within the EU.
- Car rental companies: can detect signals (false documentation, straw men,..) and provide information and data on who is renting a vehicle in the country. They also need to prohibit cash transactions.
Airports: are the most regulated but have no legal ground to prevent/check the entry of criminal gangs/individuals without an extensive criminal record, unknowingly facilitating entry.

Car manufacturers: can detect signals and provide information on data of foreign vehicles and license plates which can be shared with LEA.

Based on available resources, feasibility and priorities, the most effective barriers can be split up in LEA barriers and private sector barriers according to the respondents.

Concerning the LEA barriers:
- Providing pro-active training in identifying signals and more resources for LEAs to conduct more patrols are considered to be the highest priority among LEA respondents. It is important to note that more resources might not always be the answer but better distribution of the available resources and cooperation between LEAs could be a more efficient barrier.
- Expanding and renewing the ANPR-camera networks and examining whether or not national camera-systems could be connected to European camera-systems. This means better placement of ANPR camera’s and a general expansion within the country. Installing newer systems and updating/ removing older camera’s. Synchronizing the different ANPR systems across the country + other EU camera systems. LEAs respondents would also prefer using the existing EUCARIS database to synchronise European camera systems.

Concerning the private sector:
- All private sector respondents reported a desire to connect databases and the development of adequate regulations that could enable and facilitate data sharing between LEA and the private sector. Commonly mentioned by the respondents is the ‘lighthouse-project’, this is a data-sharing platform between private sector partners (car dealerships, car insurance companies, car manufacturers, vehicle inspection services, vehicle registration offices...). The project aims to also include LEAs in their platform, but realizes the difficulty of data-sharing between LEAs and the private sector. A possible solution, to avoid problems with GDPR regulation and privacy concerns, is to collect data on Vehicle Identification Numbers (VIN) and not personal information.

Main findings (for dissemination)

- Pro-active/prevention of vehicle theft is difficult in the process steps before the crime is committed as there are limited legal grounds to control border passing (Schengen Area). It is also impossible to control every car that passes the border.
- Comprehensive data-sharing between LEAs in general & LEAs and the private sector seems to be the most commonly recommended barrier (from both parties).
- There is a need for cooperation between LEA and the private sector, but this has not yet been established.

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6 The European Data Protection Regulation (GDPR) is applicable as of May 25th, 2018 in all EU Member States.
7 A VIN, or vehicle identification number, is a unique identifying code given to a vehicle when it’s manufactured, it serves as a car’s fingerprint, as not two vehicles share the same numbers. VIN numbers are printed on multiple locations during the manufacturing process, the most visible one is located on the dashboard.
**STEP 2: STAY**

The second step consists of the place where foreign criminals choose to stay in Belgium and is relevant for the Eastern European MO and the African MO. The African OCG’s consists of mostly permanent residents in Belgium, but African counterparts sometimes do travel to Belgium. The Eastern European MOCG’s can stay with family and/or their criminal network or rent accommodation for a couple of days/weeks. Short stays (5-12 days) and frequent return visits (2/3 times in one ‘secure’ location) in hotels, campings and AirBnb’s seem to be most common for these MOCG’s.

**Opportunity-wise** the most efficient stay seems to be:

- With family and/or the criminal network, as no registration is needed.
- In campings, hotels and AirBnb’s, as these also require minimal identification or registration and cash transactions are still permitted. Hotels seem to be the least attractive for criminals as the identification and registration of each person is mandatory in Belgian municipalities. Campings and AirBnb’s only require one person to provide identification during the registration process (in-app and in person) and there is less due diligence or control/knowledge of the amount and ID’s of other persons staying. The community officers of the local police who check for municipal registrations are also understaffed in Belgium- at least in most local police services (Janssens et al., 2019).

Some **signals** can be picked up in this process step:

- Overcrowding: too many people for the amount of space.
- Late night activity: people going in and out at strange hours, coming and going of different cars in a short time period.
- License plates on vehicles: multiple cars with different foreign plates, changing license plates. no valid insurance, different license plates on front or back plate.

The **facilitators** are mostly the family and criminal network who provide anonymous accommodation, either by use of private residence or straw men/forged documentation. Some campings are known within criminal networks and look the other way with regard to criminal activity, there are no ID checks on all renters and no control of the amount of renters within units.

The **partners** within this step have been identified as:

- LEAs: more LEA control in general, grid-control and enforcing registration by AirBnb, campings and hotels. They can also use analytical tools to identify trends/ risks of hotels, campings and Airbnb’s. Specifically the community police officers from the local police are useful within this step, they should have knowledge of the neighbourhood and are first in line to identify signals/ abnormal behaviour.
- The mayor or municipality: mayors need to put more emphasis on the municipal registration of tourists/renters and provide more resources for community officers. The municipality should encourage better due-diligence of registered stays within their district, enable grid-control by community police officers and better enforcement of municipal tax.
- The private sector (AirBnb, campings and hotels): AirBnb’s and campings can be a partner in providing a better regulatory framework to enforce official registration and diligent ID

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8 Most AirBnb’s have an in-app online registration once the accommodation is booked
checks of clients. Hotels can pick up signals and should have a good relationship with community officers.

The **barriers** selected within this step are:

- Providing more resources for community police officers, so they can be more visible in the community, is considered to be the most effective way to create barriers in this process step, as these police officers should have insight and knowledge of their neighbourhood and can pick up abnormal behaviour. In other words, more controls and an increased police presence in neighbourhoods would lead to better knowledge of what is going on in the streets of Belgian cities and municipalities according to the LEA respondents. While community police officers (and providing them with more resources) are definitely useful within this step, there needs to be a shift in the way that community police officers share knowledge with other LEAs (local information cross-roads) and are organized (more effective approach within the police structure). It might be interesting to expand this to other partners that were not included by the respondents: social inspection, community guards, neighbourhood directors and others. These last two would mean a shift in administrative enforcement.

- The registration and identification of tourists/guests in the touristic sector could be better regulated (obligatory identity controls and registration of all guests, for example) and awareness campaigns directed at owners of accommodations that are being rented would also contribute to early detections.

- Building cooperation and trust between the private sector partners in this step and LEAs could be a useful barrier. Providing the private sector with clear contact points/liaisons within LEAs (preferably community officers) and investigating the filed reports by the private sector could increase motivation to report further suspicious activity and cooperation.

<table>
<thead>
<tr>
<th>Main findings (for dissemination)</th>
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<tr>
<td>- Pro-active/ preventive barriers are harder to implement because no crime has been committed which means there are limited legal/ investigative tools available for LEAs</td>
</tr>
<tr>
<td>- Identification and registration are key within this step. No ID’s and registration required (family and criminal network) on the one hand, but on the other hand, there is limited need to identify and register all guests in certain sectors (AirBnb’s, campings and hotels)</td>
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<tr>
<td>- Community police officers are useful within this step, they should have knowledge of the neighbourhood and are first in line to identify signals/ abnormal behaviour. There needs to be a shift in the way that community police officers share knowledge with other LEAs (local information cross-roads) and are organized (more effective approach within the police structure). It might be interesting to expand this to other partners that were not included by the respondents: social inspection, community guards, neighbourhood directors and others. These last two would mean a shift in administrative enforcement.</td>
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STEP 3: INFRASTRUCTURE

The third step consists of the criminal use of Belgian infrastructure, which includes: public transport, roads, ports, telecom services, and others. Infrastructure is being used in all MO’s and can also be overarching of specific steps (for example: roads used for entry and transport are both Belgian infrastructure). As use of infrastructure in specific steps is explained in those respective chapters, this chapter will take a more general look at the opportunities, signals, facilitators, partners and barriers within Belgian infrastructure.

The biggest **opportunities** for criminal misuse of Belgian infrastructure are:

- The lack of patrols of LEAs as intervention teams need to be available for urgent calls and there are not enough resources to do more random controls on roads.
- Criminals can easily move fast and anonymously within the country and the EU
- The current ANPR camera system: there is a broad network of alternative roads which are not equipped with ANPR camera systems. The system also has a lot of limitations: bad quality of older ANPR camera’s, four different ANPR systems operating at the same time without synchronization, some country license plates cannot be recognized within the system (Hungary specifically) and the system is unevenly distributed within the country (mostly bigger cities and roads and more in Flanders than in Wallonia). Most MOCG’s have experience and know about the placement of the ANPR systems, they can easily evade them.

There are no obvious **signals** of criminal activity within this step and there is limited legal ground for preventive action of LEAs.

Except for straw men for car rental services, there are no obvious **facilitators**. Possible **partners** have, however, been identified as:

- LEAs for more patrols and being more present in public.
- Parking garages as they can monitor and register movement of criminals (retro-actively) as they are used for both storage of stolen cars and in the selection of targets (track and trace systems get installed and the vehicle is tracked home where the crime will be committed).
- Public parking attendants and civilians can be partners and report suspicious behaviour or identifying stolen cars.

Respondents are of the opinion that these **barriers** are most effective:

- Expanded and upgraded ANPR systems could contribute to early detection and become effective barriers to combat motor vehicle theft. Expanded with regard to the amount of locations the system is implemented and upgraded as in a renewed system in which the differently operating systems can be synchronized.
- EU data sharing in regards to ANPR camera systems, in which databases of different countries can be linked and systems synchronized. This indicates that EU guidelines and regulation is needed as this could lead to mass surveillance which opens ethical and other questions concerning the rule of law and fundamental rights of EU citizens.
- Data-sharing protocols in general, including with the private sector. This implies more information sharing with respect to parking garages and other privately operating camera systems. The storage of data and information on vehicles in car parks and of public parking attendants (who continuously scan vehicles in public parking spots) can be useful for LEA, as is the instalment of smart camera’s to detect trends in these spaces.
Main findings (for dissemination)

- Pro-active/ preventive barriers are harder to implement because no crime has been committed which means there are no legal/ investigative tools available for LEAs. Infrastructure also gets misused after criminal activity which will be explained in those respective process steps.
- The ANPR system is a helpful tool for LEAs but needs to be expanded (in BE and EU) and upgraded (in BE and EU). A synchronization of different camera systems is most commonly recommended and EU guidelines/regulation is needed as this could lead but this could lead to mass surveillance which opens ethical and other questions concerning the rule of law and fundamental rights of EU citizens.
- There is a need for data-sharing protocols and crossed databases between the different private sector partners and between the private sector partners and LEAs.

STEP 4: CRIME

The fourth step consists of the commitment of the vehicle theft and is relevant for all MO’s. The clearest way to introduce the fourth step is to split it up in different phases: pre-crime, committing the crime and post-crime. Pre-crime means every step taken before the crime is committed, this includes target selection and target tracking. Commitment of the crime comprises of every action criminals take to steal the vehicle on the spot. Post-crime provides insight in the steps they take after committing the crime, this includes anti-tracking and concealment of the vehicle.

Respondents employed within the car insurance sector indicate that different types of vehicle crime co-exist with vehicle theft: for example, insurance fraud, money laundering, mileage fraud, stripping vehicles, cloning vehicles, and more. Within this research project, there is a delineation of focus to car theft and theft of car parts. Only the criminal activity closely related to car (parts) theft, which includes some forms of fraud but not all, was analysed.

Pre-crime opportunities are mostly related to the selection and tracking of target vehicles.
- There is a considerable amount of luxury vehicles in Belgium that are potential targets for criminals. Target selection is based on the demands of the criminal network.
- Car thieves will scope out places where a large amount of vehicles are parked together (airports, park and rides, car parks, event locations, supermarket parking lots, shopping hubs...) and place track and trace systems in concealed places outside the vehicle. Criminals will track the desired car to preferably the house of the owners or other private places before committing the crime.
- Criminals use VPN’s⁹ and encrypted apps for communication, so no telephone signals can be detected/identified by the police.
- To enter a vehicle, access to the car key is needed (in most thefts). Criminals will use relay or replay attacks, in which the key signal will be intercepted and copied onto blank key fobs. These fobs and programming devices need to be ordered and distributed within the network. They are easily available online on the legal market.

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⁹ A Virtual Private Network (VPN) adds security and anonymity to users when they connect to web-based services and sites. A VPN hides the user’s actual public IP address and “tunnels” traffic between the user’s device and the remote server.
- Other criminals will specialize in forging documents and requesting new legitimate immobilizer keys at car dealerships in name of unconscious owners.
- Criminals use the ‘all keys are lost’ system in cars to program blank key fobs by using an ICT-tool connected to the OBD port of a car. These tools can be easily purchased online.

Once the preparation phase is completed, criminals will commit the vehicle theft. As we have entered a digital era, car theft is mostly committed using the technology within cars and keys (remote keyless car thefts). **Opportunities** consist of:

- Easy access to lock picking devices and ICT tools to aid in the relay or replay attacks and the reprogramming and blocking of key fobs, either within the criminal network (as the most expensive devices are shared) or online.
- Not only is the access to these devices easy, so is the use of them as most devices are semi-universal. Most brands can be accessed with only one device. There are also more specific devices for some luxury brands. There are multiple YouTube tutorials available online.
- There are also some opportunities that are created by car manufacturers: the use of standardized cryptography which is easily breached and the lack of variation and not random generation of key codes within brands. According to the ICT-expert respondent, manufacturers are afraid of damage to their brand/image, which is why open communication in anti-theft prevention and co-operation between manufacturers and white hat hackers is not always welcomed. This results in slow implementation of new anti-theft measures and irregular updates of unsecure systems. The fact that technology, and criminal use thereof, keeps evolving means that long term solutions to prevent car theft are difficult.

Once the vehicle has been stolen, criminals use different **opportunities** in relation to LEA action, ICT tools and private sector relationships.

- The open borders result in fast and anonymous movement for criminals between different EU countries while the mutual assistance requests for European LEA are a slow process.
- ICT tools like jammers are easily accessible and can block the LoJack Frequency Trackers of car manufacturers and other privately installed track and trace systems within the vehicle.
- The reported distrust between LEA and the private sector plays a role in the slow detection of stolen cars. LEAs have legal access to track and trace systems from car manufacturers but the request process is slow depending on the car brand. Some car insurance companies have direct access to these tracking systems in cooperation with certain brand deals, but LEA have no mutual formal contact points.

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**The All Keys are Lost system will originate the mechanical key and reset the immobilizer system to program blank key fobs with the car’s key code. The all-keys-are-lost system is used when all key fobs are lost by car owners and is created for car dealerships and mechanics. A mechanic can reprogram the key code of a vehicle onto a new empty key fob. Once a vehicle has been stolen (by relay attack or jamming) thieves will reprogram new keys. The device for reprogramming is available online (example: AliExpress website price €450-2500) and there are many tutorials available on youtube. New key fobs can be ordered in bulk and are cheap.**

Device: https://www.alibaba.com/showroom/key-programmer-for-all-keys-lost.html

Tutorial: https://www.google.com/search?q=all+keys+are+lost&rlz=1C1GCEA_enBE992BE992&oq=all+keys+are+lost&aqs=chrome..69i57j0i22i30.2210j0j9&sourceid=chrome&ie=UTF-8#fpstate=ive&vld=cid:486CCA75,vid:HDPeDSa3PM0

**LoJack transmits on a radio frequency in the 170–180 MHz range. Vehicles with the system installed send a periodic signal every several seconds on this frequency. When a vehicle is reported stolen, the rate of signalling increases to facilitate tracking.**
The **signals** that can be picked up in this step have been identified as:

- **The location, time and space principle:** abnormal behaviour in residential areas, abnormal behaviour in general (getting in and out of the car frequently), activity at night, driving slowly in residential areas or parking lots/places where cars are grouped together, bad lighted residential areas, tinted windows or broken windows, multiple people in one car, nightly activity in car repair shops, people trying to stay anonymous walking around in places where a large amount of cars are grouped together.

- **Previous criminal activity/ criminal record:** after the crime, police systems can indicate the presence of criminals by car identification.

- **Known locations and ANPR alerts:** some places are known for criminal activity by LEAs or known for use by specific MOCGs or in specific MO’S (cooling a hot car...).

**Facilitators** can be split up in conscious and unconscious aid to criminals. The conscious facilitators are:

- The criminal network: provides the know-how and tools for car theft or false documentation for ID’s or vehicles.

- Malicious car dealerships: some dealerships (Anderlecht) are known to be active in the illicit trade of stolen vehicles or providing fake key fobs and vehicle documentation (All Keys are Lost reprogramming or requesting manufacturers to provide new keys for ‘customers’).

- Malicious car repair shops or chop shops: LEA respondents know that these are present in Belgium but little is known about their whereabouts or modus operandi. Auto repair shops (both knowingly or unknowingly) provide services to car thieves (storage of cars, disassembling stolen cars in parts or re-assembling into legitimate cars). These services can be as innocent as the rental of the shops space/tools or as complicit as aiding in the process.

- The dark web: facilitates in providing untraceable illegal goods/tools for criminals (cryptocurrency is untraceable). These tools can be jammers, relay/replay attack tools, blank key fobs, blank car documentation formats and other ICT tools.

The unconscious facilitators can also be **partners** in this project, namely:

- ICT-developers: ICT-developers and retailers can help LEA with identifying the tools that are confiscated and retailers can provide them with information on buyers (if a register is opened). ICT-developers can also help car manufacturers in identifying risks and providing them with solutions and security measures/updates.

- Car manufacturers: have a big role in helping to prevent car theft by working pro-actively on security measures/updates and implementing new anti-theft ICT technology in cars.

- Internet shops: can be a partner in registering the buyers of specific tools known to be used for malicious activity and blocking the access.

- Civilians and media: media can help with increasing the awareness of civilians and civilians can pick up signals and alert abnormal/malicious behaviour to LEA. They can also implement anti-theft systems once informed with regard to MO’s (signal blocking pouches - Faraday box, turning off wireless signals, steering wheel lock, installing air tags...)

- Car dealerships and repair shops: car dealerships can identify false requests for (extra/new) key fobs by diligently checking documentation and knowledge/ identification concerning fake documentation and auto repair shops can report malicious rental requests of their space/tools
- LEAs: can identify more signals and teach these signals to patrolling teams. Once provided with training and resources they can work more pro-actively in preventing theft (more patrolling, more targeted controls). LEAs can also be a partner/point of contact for the private sector or civilians in reporting and signalling suspicious behaviour.
- Insurance companies or Insurance Europe: mandatory anti-theft prevention for clients, access for LEAs to their tracking systems, alerting LEAs to patterns/MO’s. Insurance Europe is an overarching association of insurance companies within the EU, they can be a partner in creating cooperation between different insurance companies and more trend detection concerning fraud.
- European Union, Europol and Interpol: The European Union, Europol and Interpol can be partners in creating more cooperation between different LEAs, there already are some initiatives: Frontex and Bordertask. Frontex, the European Border and Coast Guard Agency, promotes, coordinates and develops European border management in line with the EU fundamental rights charter and the concept of Integrated Border Management. They aim to help identify migratory patterns as well as trends in cross-border criminal activities. Bordertask is a collaboration of different EU LEAs and aim to patrol certain outer borders of their respective EU countries.

The barriers suggested within this step are:
- A prioritization of vehicle crime by the Belgian government, judicial services and LEA. Even though vehicle theft is declining, there is a shift to organized crime which relates to other criminal activity (drug trafficking, fraud, money laundering, infiltration of legal markets...). A lack of priority for vehicle theft results in limited investigations, limited resources and limited training within LEA in identifying signals of MOCG’s.
- A more comprehensive cooperation between LEA in Belgium and Europe is needed to combat organized crime. This cooperation needs to be also extended to the private sector, which can be useful in detection and investigation of car theft and fraud (car insurance companies, car manufacturers). Prioritising the prevention/repression of car theft within member states, shared rules/norms for documentation and knowledge in license plate identification, faster information sharing between LEA and more trust, speeding up the process of mutual assistance between EU LEAs. More data-sharing between car manufacturers, car insurance companies and relevant NPO’s and LEA was highly recommended by the respondents, preferably in a comprehensive EU database based on VIN numbers (not personal data). It might be useful to let car insurance companies take the lead on this, as they already do this for art theft and they have an existing European network with multiple initiatives (Vehicle Crime Investigation association).
- Awareness campaigns for civilians that promote anti-theft measures and educates the public in preventing recent car theft trends. The use of popular TV shows can bring awareness to civilians (Theft MO’s and prevention). Civilians can pick up signals and alert abnormal/malicious behaviour to LEA. They can also implement anti-theft systems once informed with regard to MO’s (signal blocking pouches - Faraday bag, turning off wireless signals, steering wheel lock, installing air tags...).
- Promoting anti-theft measures by all private sector partners (insurance companies, car dealerships, car manufacturers) in general. Car manufacturers have a big role in helping to prevent car theft by working pro-actively on security measures/updates and implementing new anti-theft ICT technology in cars. These can range from protecting key fobs from
interference to two-step verification systems, new lock ICT, remote shut-down systems, tracking systems...

- Expanding the cooperation between car manufacturers and ICT experts/white hat hackers. This can be done by starting bounty programs (monetized competitions for hackers), organizing more conferences for shared experiences and creating trust between both parties. Some car manufacturers already invite white hat hackers to hackathons and provide bounty programs (Tesla, BMW) but all manufacturers should organize these types of programs. They should also be organized frequently so updates are possible. ICT-developers can help car manufacturers in identifying risks and providing them with solutions and security measures/updates. White hat hackers have valuable inside information that isn’t generally known to other ICT specialists. Consultancy of car manufacturers and LEAs by white hat hackers need to be encouraged. Some specific barriers with regard to ICT have been identified in this project: more updates and new upgrades in technology systems, two-factor identification (is an electronic authentication method in which a user is granted access to a vehicle only after successfully presenting two or more pieces of evidence to an authentication mechanism), randomly generated key codes, converting the standardized cryptography, restrictions/guidelines concerning the all-keys-are-lost systems and distance bonding protocol (which is a cryptographic protocol that ensures that the key fob and the vehicle are actually close to each other (this combats relay and replay attacks, where signals are extended by criminals).

Main findings (for dissemination)

- Cars are no longer primarily being stolen by individuals in Belgium, but by organized crime groups as car theft requires more ICT-related skills and knowledge.
- ICT tools and technology are the primary weaknesses in today’s car theft trends (in all phases of committing the crime).
- Cooperation between ICT experts/white hat hackers and car manufacturers needs to be encouraged or enabled.

STEP 5: STORAGE

The fifth step of the logistical process is the storage of the stolen vehicle, this is relevant in the Eastern European MO and the African MO as they mostly arrange transport with multiple stolen vehicles in one shipment. There are two obvious ways of storage: one is public storage in which stolen vehicles need to be ‘cooled down’ and the other is private storage in rented facilities. The GPS tracking system is disabled in both scenarios by leaving GPS jamming devices in the stolen vehicles. Stolen vehicles are ‘hot’, which means that LEA is actively searching for them in a short period of time after the crime. It is very common for criminals to place these cars in public, but abandoned, places for two to three days. Once a vehicle hasn’t been tracked by LEA, further transport is arranged. The other MO is storing the vehicle in a private facility, this can include private houses/garages or the rental of storage facilities and (malicious) car repair shops if stripping or disassembly into parts is necessary.

Concerning opportunities:

- There is a large amount of vacant firms, storage facilities and (malicious) car repair shops in Belgium.
- Owners of these facilities can rent spaces to criminal organizations with no ID checks and acceptance of cash payment. These spaces also provide a lot of privacy as they are mostly located on industrial sites. Some of the more abandoned sites are also vulnerable for squatting or illegal trespassing. When ID-checks are required they will simply go to other storage facilities or use straw men for the rental. These vacant facilities have no incentive to expand competition by asking for identification.
- Another opportunity is the existence of malicious second hand car dealerships in Belgium within the African network, who welcome or demand specific stolen cars and will arrange further transport within their respective network.

These opportunities also translate into visible signals of criminal activity:
- Concerning the cooling down process, cars overnight at public car parks, open parking spaces, on the side of the road or on busy transit spots can be spotted by LEA.
- In relation to the rent of private storage facilities, nightly activity at car repair shops, car dealerships and storage facilities can be signals for LEA.

This is the first step in which facilitators and partners can be clearly separated, except for storage rental facilities. These facilitators are:
- Criminal network and straw men for legal rental of storage facilities.
- Malicious second hand dealerships: there is a large network of criminals who have infiltrated legitimate dealerships or use a legitimate dealership as a front for malicious activity (Anderlecht), these could also be used as chop shops but data is not available within LEA as they are tightly knit groups and access is limited.
- Malicious car repair shops: LEA respondents know that these are present in Belgium but little is known about their whereabouts or modus operandi. Auto repair shops (both knowingly or unknowingly) provide services to car thieves (storage of cars, disassembling stolen cars in parts or re-assembling into legitimate cars). These services can be as innocent as the rental of the shops space/tools or as complicit as aiding in the process).

The partners have been identified as:
- Car park operators: official car parks can provide LEA with data of entry and exit of cars (license plate scanning)
- Storage facility owners: these owners can report suspicious behaviour (odd rental requests, adamant refusal of ID-cards, other documentation and credit cards)
- LEA: can identify the signals or investigate reports of the private sector
- Public or private parking attendants: community parking attendants/ private parking attendants have information and data that they can share with LEA (license plate scanning records) and can also play a role in signalling abnormal behaviour (abandoned cars, suspicious cars,..)
- Labour and social inspection services: can detect fraudulent car dealerships/ car repair shops

The barriers deemed most efficient within this fourth step by the respondents can be split up in LEA barriers, private sector barriers and information sharing between both parties:
- In relation to LEA barriers, the respondents recommend more training in recognizing signals of criminal activity.
- With respect to the private sector, awareness campaigns are recommended for rental companies, legitimate car repair shops and car repair shops and civilians, in which they can be educated on visual signals of criminal activity.
- The information sharing between different parties (LEA and private sector) is recommended. This can include ICT tools and camera surveillance in car parks, information sharing about these car parks and public parking attendants (scanning of license plates) and frequent operational meetings with both parties. This indicates that guidelines and regulation is needed as this could lead to mass surveillance which opens ethical and other questions concerning the rule of law and fundamental rights of EU citizens.

Main findings (for dissemination)

- There seems to be infiltration of criminal activity within the legal market of storage facilities, car repair shops and car dealerships. More reporting by LEAs and more diligent control by the social and labour inspection services can result in detecting these companies (pseudo-self employment, foreign headquarters,..)
- Information sharing between the private (car operators, storage owners, public and private parking attendants) and public sector (inspection services and LEAs) is key in preventing the storage of motor vehicle trade.

STEP 6: TRANSPORT & TRADE

The sixth step is transport and trade, and is relevant for all MO’s. This step is split up in transport of stolen vehicles or vehicle parts (by road or overseas) and trade (physical and online). There are general trends and opportunities (relevant for both transport on road and overseas and online and physical trade) identified by the experts within this step:
- There is a high demand and value of (stolen) car parts in European countries (examples: airbags, tires, specific brand accessories (Mercedes, BMW, Jaguar), catalysts and ICT), while the value and demand of (stolen) complete cars is higher in non-European countries.
- Cars and car parts are not labelled as illegal goods which means that there are no specific reasons to check and monitor these goods by customs, shipping companies, postal services, expedition offices, etc. Even though there is a registry of stolen items, it is impossible to check every item.
- There are also no coherent policies by which data needs to be collected by shipping companies. The minimum requirements of data collection within shipping companies and postal services varies between EU countries. Data sharing or trend detection is therefore made impossible.
- It is very easy to forge documents and license plates, as there are websites that sell access to blank formats online. These forged documents can be used for multiple reasons: insurance fraud, cloning of vehicles, security during controls and validating legitimate sales (online or physical).
- It is also easy for criminals to take advantage of the existing legal car trade circuits and infiltrate or mimic these practices. In addition, there is a large criminal network available that will provide resources for transport and trade. Criminal networks can also trade with each other, stolen cars do not always end up in the legal market.
With regard to ICT, there is easy access and use of encrypted apps and VPN’s which can conceal communication within these networks and jammers to disable track and trace systems within cars.

Some **opportunities are specific for transport by road**, which is most commonly done by loading stolen cars into trucks and containers:
- Open borders provide a secure option for transport as there is the least risk for LEA/ private sector controls.
- Most criminals try to cover their tracks by switching between license plates during transport. False license plates are easy to access online or within the criminal network.
- Criminal networks take advantage of poor working conditions in some Eastern European countries and low wages to attract (unknowing) truckdrivers for employment within their criminal network. Even though there is a European authority (European Labour Authority) fighting this abuse, it still happens.

Other **opportunities are specific for transport overseas**, which is mostly done by registration with expedition offices and ports. This type of transport can consist of Roll-on-Roll-off transport (RORO) or container shipments with transport to and from ports separately:
- Criminals take advantage of the massive amount of container shipments that gets transported every day from multiple ports in Belgium and other European countries.
- Customs agencies and expedition offices have not enough resources to monitor every container and there is no obligation to thoroughly check documentation. The international trade keeps evolving and growing, there is a need for policy decisions based on risk taxation.
- Criminals easily choose between ports in Belgium, or go abroad to other ports. In general, all ports are compromised by the growing international trade and there are no clear indications if certain ports are more vulnerable than others.

Criminals also exploit specific **opportunities within the vehicle trade**, which can be split up in online and offline/physical trade. The infiltration of car thieves within legal businesses (car dealerships) or the legal market (online marketplaces) applies to both of these trades.
- Criminals can set up their own businesses and franchises to launder money. These businesses and franchises have their headquarters outside of the country and are hard to regulate/investigate as they claim to be (pseudo-) self-employed and provide little information.
- There is easy access to online second-hand websites, in which there are varying levels of security. Online websites that trade in second hand cars specifically, have built in security measures. General online second-hand selling platforms like eBay, Facebook marketplace and other second-hand websites, have little control and security measures implemented. Anonymous trades on these platforms are still possible.
- There are limited resources for vehicle registration agencies and vehicle inspection services to check the validity of all registration documents, invoices and VIN numbers. In Belgium there is an initiative that tries to counter mileage fraud and stolen vehicle trade by obligating the seller to provide a Car-Pass. This document is issued by vehicle inspection services and provides information on mileage, ownership, recalls, emissions and inspections after accidents. The inspection service needs to validate the identity of vehicles by checking multiple VIN numbers, but are under resourced.
The Car-Pass is only mandatory in Belgium, with similar initiatives in Luxembourg and the Netherlands, which results in more export of stolen cars and less import.

There are some signals that can be picked up in this process step:
- Patterns in registration to be recognized by expedition offices (ID, amount of cargo, frequency, destination country, ID country,..).
- False documentation: criminals use false documentation for the car/containers and their own identification. During checks, car thieves will provide digital documentation for the stolen cars, these documents are harder to verify. Having multiple documents of different vehicles or identities on mobile phones can also indicate criminal activity.
- Refurbished cars at vehicle inspection services: vehicle inspection services need to verify multiple VIN's before validating a vehicle so they can detect refurbished cars when hidden VIN's don't match up.
- Cheap car parts or cars on online platforms: abnormal low prices in comparison with other advertisements online can signal illegal goods.
- Vehicles stacked on lorries or containers without care: criminals will try to make as much profit as possible in one shipment so they will stack vehicles without much care (it’s cheap to repair the damage in country of export).

Except for malicious car dealerships and the criminal network that provides transport or trade services and false documentation, the facilitators within this step can all become partners:
- Expedition offices: can help LEAs by registering shipments and use trend detection algorithms to identify networks. Introducing new minimum requirements of information to register at expedition offices and diligent ID and VIN checks.
- Truck drivers: diligent background checks on employers and refusing illegal labour.
- Websites or online second hand platforms: minimum standards of documentation for online sale, mandatory Car-Pass and better monitoring of goods and users (identification by ID-card or Itsme app).
- Scrap yards: can be a partner for LEAs and signal illegal or suspicious behaviour (requests for certain brands, frequent buyers,..).
- Customs and LEAs: more control and diligent VIN checks on borders/in ports. LEAs more controls and random checks/ learning to identify signals or trend detection.
- Vehicle inspection services: can be a partner by reporting suspicious behaviour and to adhere to the mandatory check of multiple VIN's on vehicles.
- Postal services: can be a partner by monitoring shipments and requiring a minimum of information for shipments. The national postal service is a partner within PARSEC which aims to deliver a set of solutions by developing innovative tools, services and security management views to fight the abuse of postal and express courier flows for criminal and terrorist purposes. Adding vehicle and vehicle parts theft as a focal point to this project, could result in better trend detection within the EU.

There is an enormous amount of possible barriers identified within this step, the most important ones have been prioritized by the experts. First of all, there is a need for European cooperation and legislation:
- A coherent EU policy on the minimum of data collection for the private sector (insurance companies, car dealerships, postal services, manufacturers,..) and government (LEA, vehicle registration agencies, vehicle inspection services,..) based on the vehicle, not personal
information (the Lighthouse Project of the Vehicle Crime Investigation Association). It would be useful to let insurance companies take the lead on the development of this project as they already do this in the prevention of art theft. There is also a need for EU guidelines and regulation to prevent problems with the GDPR regulation in EU countries.

- An EU initiative to expand the Car-Pass system and synchronizing the collected data within the existing EUCARIS network.
- A EU policy on prohibiting cash transactions within the new and second-hand car market above 3000 euro applicable to all EU countries.
- A coherent EU policy on minimum requirements for data collection within shipping companies, which will enable them to conduct trend detection and better identification of criminal activity.
- Concerning EU cooperation, there is also a project called PARSEC which aims to deliver a set of solutions by developing innovative tools, services and security management views to fight the abuse of postal and express courier flows for criminal and terrorist purposes. Adding vehicle and vehicle parts theft as a focal point to this project, could result in better trend detection within the EU.

The experts also identified barriers that can be implemented on a national level:

- More resources for custom agencies and better training for LEAs is the highest recommended for this step by the LEA respondents. It is important to note that more resources will neither solve or prevent motor vehicle theft. More manpower for custom agencies and better training for LEAs can be beneficial but creating more efficient systems or improving the existing systems for crime prevention or repression might be more valuable. It would also be interesting to see if shifting responsibility in certain aspects of this project to private partners, can relieve LEAs and other governmental agencies. Relying on these agencies for all crime prevention and repression is setting unrealistic expectations. The postal service or other package couriers could assist custom agencies while the insurance sector, manufacturers, dealerships and other private sector partners could assist LEAs.
- Regulation and minimum requirements for expedition offices in regard to data collection and documentation checks and banning cash transactions for transport.
- Better identification of forged documentation in the private sector or creating more efficient automated programs to verify documentation.
- Mandatory verification of identity of vehicle and seller in second hand car trade businesses and online platforms.
- Awareness campaigns for civilians on MO’s and trends in the illegal trade of stolen vehicles.
- A national version of the Lighthouse project, which is a shared database between different actors in the private sector (insurance, vehicle inspection services, car registration services, LEA, Ministries, Car Pass, car dealerships, car constructors, ..) with information based on VIN (no personal information). Police can share data on stolen cars, which can assist car dealerships in their day to day buying and selling of cars. Car constructors can share data of vehicle (tracking systems, history of damage and updates, ..) with other partners. There needs to be an assessment of this with the GDPR regulations and in which way this database can function (not everyone needs to have access).
- Expanding the Car Pass initiative to contain more information i.e. mention of illegal activity (stolen vehicles), leases on vehicles, replaced parts,..
Main findings (for dissemination)

- Concerning transport and trade, the experts recommend more EU-targeted barriers as transport and trade is an international business and national initiatives are less useful within this context.
- As vehicles and vehicle parts are not illegal goods, there are limited opportunities for monitoring, checking and verifying these shipments.
- A shift in responsibilities from LEAs and other governmental agencies to private sector partners might be more beneficial than providing more resources. This might result in more realistic expectations for LEAs, while also relieving them of having to solve/prevent every type of crime.

STEP 7: PROFIT

The final step of the process consists of the way in which criminals make profit of car (parts) theft. Car thieves take advantage of the multiple purposes and demands for stolen cars abroad: exchanging cars for other illegal services/resources, money laundering, use in war territories and terrorist organizations and absence of certain vehicle brands within regions abroad. As long as stolen vehicles are in strong demand, the supply will be organized.

The most common opportunities for profit in the car theft business is:
- The limited checks and balances done in second hand car markets abroad, especially non-European countries i.e. Africa and Russia.
- Cars have a lot of value to exchange in the criminal world
- Money laundering opportunities (fraud and cash transactions)
- Easy access to encrypted apps for trade
- Money gets reinvested in the legal market (malicious car dealerships, car repair shops)
- Easy access to cash transfers (Western Union) and a large amount of cash friendly places.

There are signals of criminal activity that can be identified in this step:
- A large amount of cash exchanges
- The living standards compared to official employment
- Multiple phones present on one person
- Multiple bank transfers and frequent cash deposits within one family or a legal business

Facilitators and partners are identified as:
- Second-hand car dealerships abroad: if the demand for certain vehicles in non-EU countries and guaranteed sales without care for legality remains possible, the supply will not decrease. Second-hand car dealerships are facilitators but can be partners if illegal trade in stolen vehicles is no longer accepted.
- Criminal networks and terrorists: these facilitate the illegal trade in vehicles and drive the demand for stolen vehicles
- Money transfer services i.e. Western Union and Money Gram: can be partners when anonymous transfers are no longer accepted and there is a registration for transfers verified with ID’s or Itsme app.
- Financial institutions: are partners in detecting criminal behaviour and tracking and tracing of money trails.
Concerning barriers, the respondents made a distinction between repressive and preventive barriers, with regards to **repressive barriers**:
- There needs to be a better and more automated tracking of money trails. Before transfers are completed, there needs to be a risk taxation system. Financial institutions are creating more sophisticated ‘Know Your Customer’ (KYC) services, but preventive action needs to be developed.
- Cash transactions should be restricted in the EU (Belgium has a maximum of €3000 cash transactions in vehicle trade).

**Preventive barriers** can include:
- Risk factor analysis by financial institutions with a focus on preventive action. The algorithms created within KYC services need to be expanded to pro-active detection of high-risk transactions.
- Better and more comprehensive regulation and legislation (BE and EU) of the cash transfer services active within the country of EU.
- More efficient tracking of cryptocurrency trades within criminal networks and more development of expertise within LEAs and private sector partners.

**Main findings (for dissemination)**

| - Demand for luxury (stolen) cars is strong in certain areas where specific cars are not sold, this will always result in a criminal supply. Especially when certain cars are regarded as symbols of status (Range Rover, SUV’s, luxury brands). |
| - Second-hand car market abroad (mostly outside the EU/USA) is less regulated and there are limited checks and balances in these regions. Some countries are corrupt and have open sales of stolen cars where there is no need for concealment of the true identity of a car. |
| - More development of expertise within LEAs and private sector partners in cryptocurrency is needed. |

**DISCUSSION**

The Belgian barrier model provides interesting insights in the logistical criminal process of vehicle theft and its relevant private sector partners. These insights are related to the available research and expertise, the model itself and its limitations, the partnerships identified and cooperation between the stakeholders and the future for the fight against organized motor vehicle crime.

The available research and expertise in Belgium in relation to motor vehicle theft is limited, which means that the constructed barrier model is vulnerable to errors and mistakes. The respondents have experience within the phenomena of organized vehicle theft but as there is no longer a specific law enforcement section specialized in vehicle crime within the Belgian integrated police, this experience is fragmented in different regions with varying focus. The different regional law enforcement agencies from the Belgian federal police, were confronted by different MOCG’s with varying modus operandi and there was no diligent information sharing between these police agencies. This affected the quality of the data in this report, as ‘trends’ were analysed regionally and not nationally. Despite the fragmentation, similarities in the results were found concerning the use of ICT tools and the role of the private sector. More cooperation between law enforcement agencies
Concerning the barrier model, it is clear that the barrier model is somewhat out of balance. The knowledge of LEA in relation to some steps was bigger than others (specifically in the ‘crime’ and ‘transport & trade’ steps), this indicates that some steps within the logistical process are not a focal point in criminal investigations. In addition it seems that the steps that occur before the crime is committed are less interesting for law enforcement agencies. This is expected, as there is limited legal ground for action in these steps but it also indicates that pro-active and preventive investigations are no priority within Belgian law enforcement agencies.

It is important to note that some limitations for this barrier model have also been identified. This relates mostly to the scope of this model, which is delineated to vehicle (parts) theft. During the construction of the barrier model, multiple private sector partners were included but some of these partners are less confronted by vehicle theft than vehicle fraud (for example: insurance sector). It is clear that vehicle fraud is closely related to, and sometimes overlaps with, vehicle theft, therefore it is difficult to construct a comprehensive barrier model that also includes relevant overlapping criminal activity which is prioritized by some of the private sector partners. Not including vehicle fraud makes cooperation difficult, as some priorities for the private sector is then ignored.

Speaking of the partnerships and cooperation between the stakeholders, there are some interesting findings in relation to the private sector. There seems to be a great demand for cooperation from both the public and the private sector, as most of the proposed barriers indicate participation of both parties and information/data sharing, but there is also a noticeable distrust between them. Both parties are frustrated by a lack of cooperation, but also cannot seem to concede with each other’s requests for participation. This was also clear during the process of this project, as an open focus group between both parties was deemed inconceivable. The LEA experts did not feel comfortable to share information if the private sector was present, mostly noting the commercial interest in LEA data while the private sector noted that – in view of consumer safety - the measures taken should be person-independent and focused on vehicle data instead. Even though both parties agree on the value of data-sharing based on vehicle information, the distrust between both parties is a massive hurdle.

All respondents agree that motor vehicle theft and the modus operandi of criminal gangs are flexible and changing rapidly, and that the barrier model could be a useful instrument if - and only if – it is being updated regularly to reflect changes in the field.

**Most important lessons learned (for dissemination)**

- There are some limitations to validity of the barrier model based on the limited availability of research and expertise. The delineation to vehicle theft, and thus the exclusion of fraud, can result in a lack of interest in private sector parties that deal with fraud more than theft.
- Cooperation between the public and private sector is in high demand by all parties, but doing so requires creating trust between the two sectors first.
- The barrier model needs to be reviewed frequently and updates are necessary as criminal gangs change their modus operandi fast and are flexible.
Conclusion

Even though there has been a steady decline in motor vehicle theft in Belgium, there is a noticeable shift from regular motor vehicle theft to organized motor vehicle theft which changes the perspective in prioritization of this phenomena. As organized crime results in the threat of undermining a rapidly expanding and changing society, it requires national law enforcement agencies to gain more in-depth regional knowledge and a more international-oriented approach to combat it.

Understanding the phenomena of organized motor vehicle theft in Belgium is made difficult by the absence of scientific research into this topic. The construction of this barrier model provides the first insights in the Belgian position and role within the international context. The model confirms the limited information that is available; mobile organized crime groups committing vehicle theft are present in Belgium, their modus operandi are known and indicate a more ICT-related approach to vehicle theft and the most common targets are identified.

The relevant private sector partners are also identified but, as there are many, a prioritization needs to be done keeping the international context of motor vehicle theft in mind. The cooperation between the public and the private sector is in high demand by all parties, but doing so requires creating trust between the two sectors first, before effective partnerships can be established. It is, however, clear that to be effective, there likely needs to be an integrated approach. Cooperation between law enforcement services, government departments, companies, organizations and entrepreneurs in the private and public sector will be required. Results can only be achieved when the identified barriers are combined with each other. There are some initiatives by the Vehicle Crime Investigators association to diminish the gap between public and private partners, both in Belgium as international, which indicates that a positive outcome is achievable.

Most important lessons learned (for dissemination)

- Motor vehicle theft is declining in Belgium, but organized crime is expanding it’s part in this phenomena, a new international and active approach is needed to prevent the undermining of society.
- The results of this research resulted in the first barrier model in regards to motor vehicle theft in Belgium, more research is needed to validate the results.
- There needs to be a shift in mentality and trust in regards to the cooperation of the private and public sector, some initiatives exist but more effort is needed.
Bulgarian barrier model case study

Introduction

In Bulgaria car thefts have been one of the iconic crimes of the crime-ridden 1990s and early 2000s and a commonly used example for the inability of Bulgarian governments to curb organised criminality. Although car theft numbers dwindled in the last ten years, Bulgarian Ministry of Interior still considers vehicle crimes among the high priorities with regard to crime prevention.

According to the most recent data from Eurostat, in 2017-2019, Bulgaria ranked twentieth among the EU Member States in terms of the number of stolen motor vehicles per 100,000 inhabitants — way beyond the average rate of recorded offences for the EU.

![Theft of motorized land vehicles, average 2017-2019, Eurostat](image)

**Figure 10: Theft of motorised land vehicles, average 2017-2019 (Eurostat, 2022)**

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13 Ministry of Interior. Objectives for the Activities of the Ministry of Interior in 2022. Online at: https://www.mvr.bg/docs/default-source/planiraneotchetnost/%D1%86%D0%B5%D0%BB%D0%B8-%D0%BD%D0%B0-%D0%BC%D0%B8%D0%BD%D0%B3%D1%81%D1%82%D0%B5%D1%80%D1%81%D1%82%D0%B2%D0%BE-%D0%BD%D0%B0-%D0%B2%D1%8A%D1%82%D1%80%D0%B5%D1%88%D0%BD%D0%B8%D1%82%D0%B5-%D1%80%D0%BD%D0%B1%D0%BE%D1%82%Do%B8-%D0%B7%Do%Bo-2022-%Do%Bo.pdf?sfvrsn=6edd8db0_2

The Ministry of the Interior data indicate a steady decline over the past twenty years, with only a slight peak between 2013 and 2015. The overall trend of car thefts in the last twelve years is downwards and officially recorded offences declined to a historical minimum (Figure 12).

The COVID-19 pandemic of 2020-2021 contributed to an additional drop in car thefts because of the imposed restrictions on the movement of citizens and other logistical obstacles both within the country and across borders. Since the beginning of 2022, there has been a slight increase in the theft rates, possibly due to the lifted COVID-related restrictions (LEO-1, LEO-2, LEO-4, LEO-6, LEO-7, LEO-8, PA-2, PA-4). Although the number of stolen vehicles is declining, their average price is steadily rising (LEO-1, PA-4). If in 2005, the average price of a stolen vehicle was 3100 EUR, in 2019, the average price is already 10000 EUR.

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16 Art.194-196a; art.198-199; art. 346, para 1.2.5 and 6 of the Penal Code. Source: Author’s elaboration on data from the Ministry of Interior
According to the police officers interviewed, the bigger part of vehicle thefts occurs in the capital. This development unfolded after 2004. Approximately half of all vehicle thefts in Bulgaria take place in Sofia, which accounts for the majority of vehicle thefts. The rest occur in major regional cities such as Burgas, Plovdiv, and Varna, as well as in the big resorts such as Sunny Beach and Bansko (LEO-1, LEO-3, LEO-4).

The dwindling numbers of motor vehicle theft offences in the past decade also contributed to reducing the number of sentenced offenders. The number of effective and suspended sentences nearly halved from 273 in 2010 to 159 in 2020.

**Social organisation of the market for stolen vehicles**

Since the peak of car thefts in Bulgaria during the 1990s, this crime was primarily organised. While in the 1990s, many of the car thefts were embedded in the large hierarchically structured organised crime groups known as ‘grupirovki’ (E.g. VIS, SIC), nowadays they participate in small and largely fluid collectives that rather function as criminal networks (LEO-1, PA-2, PA-4). In any case, the complexity of the crime requires the use of specific expertise, logistics and expensive equipment, which are not easily accessible, hence the need for accomplices and facilitators (LEO-1).

Currently, most vehicle thefts in Bulgaria are perpetrated by small crime groups consisting of two or three perpetrators that operate locally and often cooperate. The typical perpetrators are Bulgarian citizens, the most experienced of whom have operated since the 1990s (PA-2). Some groups are also involved in other criminal activities, such as drug trafficking, card skimming, and robbery (PA-2, PA-4). According to one of the interviewed law enforcement experts, there are at least 10 to 12 criminal groups with 30 to 40 individuals engaged in MVTs only in Sofia (LEO-4). These groups are usually embedded in more extensive criminal networks, wherein they have access to

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various facilitators that provide ICT expertise, document forgery, and fencing of stolen vehicles or vehicle parts (LEO-2).21

The role of the fencers (‘resellers/middlemen’) is essential. These individuals order vehicles of particular brands and models, negotiate quantities and prices and find buyers for stolen vehicles or vehicle parts (PA-2). Typically, fencers are legitimate owners of auto salvage yards, used-car dealerships (car yards) and auto repair shops and may operate with two or three groups of car thieves22 (PA-2). In the last years, fencers most often place orders for auto parts of high-end vehicles, a tendency exacerbated by the supply-chain problems during the COVID pandemic and immediately after it (LEO-1, PA-2).

Among the most indispensable facilitators are those selling equipment for unlocking and igniting keyless vehicles to thieves. There are several types of ICT tools that are used in car thefts: 1) remote keyless system devices (relay attack stations that retransmit the keyfob signals broadcasted to the vehicle by amplifying or boosting it); 2) reprogramming tools for creating new car keys (after connecting to the OBD port allow to reprogram the key fob); 3) jamming devices (to jam the signal between the key fob and the vehicle or jam vehicle's GPS signal); 4) other locksmith tools for hacking car key fobs (Nintendo Game Boy device that can emulate car keys for several brands of cars).23 Some tools, such as jammers, are freely available on the Internet. However, certain persons with locksmith expertise specialise in selling specialised hacking tools such as relay attack stations, reprogramming tools and the notorious Nintendo Gameboy Device (LEO-1). Usually, the software for these tools is developed by Russian and Ukrainian criminal groups, and their Bulgarian counterparts only tweak freely available devices and install the hacking software (LEO-2). The tools cost between 5000 and 30000 euros, depending on the type of brands and models they can hack and their functions (LEO-1, LEO-4, PA-2, PA-4).

Other important facilitators are the mechanics operating the so-called ‘chop shops’ – usually car yards or garages where stolen vehicles are disassembled. The sale of the auto parts from the stolen vehicles then takes place at specialised Bulgarian and international, online marketplaces (PA-2). Closely related to the mechanics are the so-called knockers/car fitters, who disguise the car by altering the VIN engine number, chassis, and other parts of the stolen vehicle, as well as concealing the vehicle’s markings, data, and other identifying characteristics.24 Actors providing document forgery and corrupt police officers that arrange smooth registration of stolen vehicles are also among the critical facilitators of car theft groups.25

Typically, car theft networks operate locally since moving the stolen vehicle on longer distances increases the risk of detection and apprehension by the police. The necessity to rely on a wide range of trusted facilitators also restricts mobility (LEO-1, LEO-4). Nevertheless, many car theft

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2 The aforementioned interviews are cited in the following way to make citations simpler. Law enforcement officers’ interviews are cited as LEO-1 through LEO-10. The only customer officer is quoted as CO-1, and the private actors are quoted as PA-1 through 6. The list of all interviewees is provided in the appendix.
25 Ibid.
groups from the countryside come to steal in Sofia since the city provides many more opportunities regarding the availability of vehicles from certain brands and models. In this regard, perpetrators from Pernik, Montana, and Vratsa most often come to Sofia (LEO-1). Sofia-based groups also often operate at the seaside during the summer season. In such cases, groups usually negotiate and use the services of local facilitators – e.g., for hideouts or disassembling of the stolen vehicle (LEO-1, LEO-3, LEO-4).

Since the country acceded to the EU, car theft has evolved from stealing mass-market to high-end and predominantly keyless vehicles. Nowadays, thieves target luxury vehicles priced above 25000 euros. Primarily due to the profit, risk, and money invested in equipment, which is frequently sold at this price. Currently, high-end KIA, Hyundai, and Mitsubishi models from 2014 to 2020 are the most frequently stolen automobiles (LEO-1) since several Bulgarian criminal groups obtained the notorious ‘Nintendo Game Boy’ device, which allows them to swiftly unlock and ignite a number of keyless vehicles from these brands (LEA-1).

Although there are some recently documented cases of Bulgarian vehicle theft networks operating in Western Europe, with most cases in Spain and Italy, there is limited cooperation with criminal groups in Bulgaria (LEO-1, LEO-2). The previous practices of trafficking stolen vehicles from Western Europe to Bulgaria to sell them domestically or re-export them to third countries have substantially decreased in recent years (LEO-1, LEO-2). However, there is some cooperation related to the so-called ‘vehicle cloning’, where a stolen vehicle in Bulgaria is given the identity of another residing in Western Europe. Such cooperation might involve stealing license plates, and VINS of cars in Western Europe or buying crashed vehicles at an auction (LEO-1).

The current state of the market is also a result of the criminal group’s adaptation to the comprehensive administrative measures introduced by the Bulgarian authorities in the early 2000s to curb the widespread car theft and trade in stolen vehicles. Integrating national customs and police databases with international databases such as the Schengen Information System also allowed stricter control on vehicles entering and leaving the country since police authorities had the opportunity to check whether a particular vehicle is registered as stolen in some of the Schengen area countries. Other essential administrative measures included the notarisation of each vehicle purchase and sale agreement, document check and physical inspection of all vehicles and their VINS by traffic police departments before registration of the vehicle and its new owner, mandatory registration of the new owner by the municipal authorities (PA-1). Moreover, in the past several years, the registers of the police, municipalities and the Bulgarian Notary Chamber have been digitalised and connected, which allowed remote access to them by the Executive Agency Automobile Administration, companies providing the mandatory annual technical inspections of vehicles roadworthiness and insurance companies. The electronic registers secure the automated exchange of information and reduce possibilities for evasion of control, document fraud and corruption (PA-1).

However, the measures also have unintended consequences. The sale of stolen vehicles in parts instead of selling them in one piece is one of the ways criminals evade the introduced checks and

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controls for the registration of new owners. ‘Cloning’ vehicles, which makes it more difficult to detect a stolen vehicle by checking documents, is another practice that emerged in an attempt to circumvent introduced border and administrative measures.

Modus operandi
The typical car theft in Bulgaria follows modi operandi and crime scripts that have changed little since the late 1990s[^29]. The modus operandi generally follows the steps described below:

- Usually, the theft of a particular type of vehicle is ordered (such as the vehicle’s brand, model, colour, and year of manufacture) by a fencer (reseller, intermediary, or middleman). The fencer is often an owner of a junkyard or a used-car dealership. Sometimes the thieves act without a specific order and subsequently offer the car to a known fencer (LEO-1, LEO-2, LEO-4).
- Once the car thieves accept the ‘order’, they search and identify a car of the requested brand and model. They also track down the driving and parking routines of the owner (LEO-1, LEO-2, LEO-4).
- The theft usually occurs at night, although cars are increasingly being stolen from malls and big supermarket store parking lots in daylight. Since thieves predominantly target keyless vehicles, they usually use various electronic devices for unlocking and ignition. The most often used method is a relay attack, where thieves temper the communication between the keyfob and the vehicle using a device to intercept, boost and retransmit the signal. Typically, car thieves intercept the signal from a keyfob inside a vehicle owner’s house. One of the thieves intercepts the signal from the keyfob, and a second one places another device near the car, relaying a message to unlock and ignite the engine. Once they unlock the car and get it running, they drive off with it. Relay attacks are usually carried out by at least two or three perpetrators. Two of them handle the relay attack equipment, and the third acts as a ‘watchman’ – looking out for passers-by and police (LEO-1, LEO-4).
- Unlike with relay attacks, a single person can handle Nintendo Gameboy Device. The exact technology behind the device is not known, but apparently the device does not need to intercept a signal from a keyfob to unlock and ignite the car. In order to hack the car, the perpetrator needs to push once or twice the lock of the car. The device intercepts the signal, reads it and emulates a key almost instantly. The thief can either directly unlock and start the engine or save the key and come back later to drive the car off. (LEO-1, LEO-4).
- The next step is to drive the car off to a safe hideout. Usually, this is a garage or a private yard in relative proximity (usually within an hour’s drive). The preferred areas for theft are those near the ring road because it provides a quick escape route. Since stolen vehicles are usually equipped with GPS transmitters, thieves use a jammer to evade detection during drive off. Similarly, they also use jammers at hideouts to conceal the stolen vehicle’s location. Such garages are often rented with a fake ID, through a middleman, or both (LEO-1, LEO-2, LEO-4). Alternatively, they leave the car in a desolate place or a private yard in depopulated villages for a few days to ascertain that no active GPS transmitters remain uncovered.
- After thieves remove the GPS transmitters at the hideout, they usually transfer the vehicle to a chop shop or a used-car yard. There are at least four possible scenarios for what will happen next with the vehicle.

a. Most vehicles are **disassembled and sold for spare parts** on the domestic market or exported to neighbouring countries such as Serbia and North Macedonia (PA-2, PA-4, LEO-1).

b. The vehicle could be **‘cloned’ and sold abroad** or in Bulgaria with new documents. In such a scenario, the VIN engine and frame numbers are altered to match those of a legitimate vehicle. If the vehicle is exported abroad, it usually is shipped via Burgas or Varna shipyards or smuggled to Greece and Turkey (or directly to Turkey), from where it is transferred to the Middle East or former Soviet Union countries (PA-2, PA-4, LEO-6, LEO-7, LEO-8, LEO-9). The most commonly smuggled stolen vehicles, according to Border police officers, are Rovers and Mercedes (LEA-6, LEA-7).

c. Thieves approach vehicle owners for **ransom-seeking**. Such practices are nowadays rare (LEO-1, LEO-5).

Part of the reported car thefts is related to **insurance fraud**. The targets of such frauds are, again, usually expensive vehicles. In this case, the perpetrators and the car owner cooperate, and there is no unauthorised taking, even though it is reported to the police as a car theft. The car owner typically signals police with a delay of two or three weeks (LEO-1). The car reported as stolen is usually handed over to a chop shop or an auto salvage yard, disassembled, and the parts sold. In other cases, the car could be smuggled out of the country with falsified papers. Thus, in general, the fencing of vehicles in insurance fraud schemes resembles the fencing of stolen ones (PA-4). The Sofia-based criminal groups usually use used-car and auto salvage yards, primarily in Pernik and, to a lesser extent, in Vratsa, Pazardzhik, and Dupnitsa (LEO-1, LEO-3, PA-2, PA-4). Used-car and auto salvage yards in Varna, Shumen, Dobrich, and Pleven are typically used by other non-Sofia-based networks (LEO-2, PA-4).

<table>
<thead>
<tr>
<th>Main findings</th>
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<tr>
<td>- Most car thefts in Bulgaria are committed by <strong>local criminal groups</strong> utilising elaborate logistical networks of facilitators.</td>
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<td>- The number of car thefts in Bulgaria has dropped over the years, although nowadays, most stolen vehicles are <strong>high-end keyless luxury automobiles</strong>.</td>
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<td>- Most car thefts involve using <strong>sophisticated ICT tools and methods</strong> such as relay attacks, reprogramming the fob, and jamming the GPS signal.</td>
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<td>- The bigger part of car thefts is perpetrated to <strong>disassemble and sell the stolen vehicle for spare parts</strong>.</td>
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Barrier Model

The barrier model proposed as a starting point for this study builds on the model developed by CCV and ENAA (2020) to analyse organised property crime in the EU. The model has been utilised to analyse different types of crimes, such as trafficking in human beings, drug trafficking and organised property crime, to identify adequate prevention measures. The barrier model approach starts by scrutinising the crime script and the logistical model utilised by the criminals to commit a crime. Then it prescribes the identification of facilitators and opportunities that make the crime possible. Drawing on this, the model allows for determining possible signals and barriers that public and private partners can use to detect, prevent or disrupt criminal operations effectively.

The methodology for the current study suggests seven main steps related to the commission of vehicle crime – Entry, Stay, Infrastructure, Crime, Storage, Transport & Trade, and Profit. They have been selected to harmonise the data collection in the six EU countries covered in the current study. The methodology assumes that mobile organised crime groups actually perpetrate a substantial part of vehicle crime in the EU. However, the data for Bulgaria suggests that vehicle crime in the country is perpetrated mainly by Bulgarian criminal networks, and there are no mobile organised crime groups such as the one observed in many Western European countries. Therefore, the typical crime scripts in Bulgaria slightly deviate from this initially agreed model since perpetrators are Bulgarian citizens and stages such as entering, staying and using infrastructure in the country are redundant.

The identified typical script of car thefts in Bulgaria generally fits only in four of the suggested steps: Crime, Storage, Transport & Trade, and Money Laundering.

STEP 1: ENTRY

The step does not apply to Bulgaria. The collected data suggest that predominantly local criminal groups perpetrate vehicle crimes in the country, and transnational MOCGs are missing.

STEP 2: STAY

The step does not apply to Bulgaria. The collected data suggest that predominantly local criminal groups perpetrate vehicle crimes in the country, and transnational MOCGs are missing.

STEP 3: INFRASTRUCTURE

The step does not apply to Bulgaria. The collected data suggest that predominantly local criminal groups perpetrate vehicle crimes in the country, and transnational MOCGs are missing.

STEP 4: COMMIT A CRIME

This step covers the preparatory activities, such as identifying and tracking a suitable vehicle by the thieves and the theft itself (unlocking and igniting, driving off with the vehicle).

Opportunities:

- **Unsecured parking lots** – most car thefts in the country occur in Sofia and other big cities such as Burgas, Plovdiv and Varna. One of the significant driving factors for this is the
numerous unsecured parking lots and the street-side parking in the residential areas of Sofia and the other big cities. These parking lots usually have unrestricted access, low or missing lighting, and a lack of CCTV, which, combined with the higher anonymity of big cities, creates abundant opportunities for thieves to identify a target or steal a vehicle undisturbed not only during night-time but also in daylight.

- **Parking lots of large retailers, malls and outlets** – these parking lots work primarily during daytime, have CCTV surveillance, controlled access and exit and security guard. However, the constant and extensive flow of people and cars makes it difficult to monitor and prevent suspicious activity. These factors provide good opportunities for criminals to scan, identify suitable targets, and even commit thefts.

- **Low presence of police patrols during night-time** – police in big cities do not have enough personnel and have struggled with underfinancing for many years, and because of that, they can afford to maintain a limited presence of police patrols, especially in residential areas.

- **Well-developed street infrastructure** – the city’s upgraded transport grid, especially the presence of city ring roads, provides enhanced opportunities for criminals to escape when driving off with a stolen vehicle quickly.

- **Vulnerabilities of keyless technology** – keyless technology helped significantly reduce car thefts in the last decade, but it has also opened up new vectors for attacks by criminals. Car thieves use relay attacks, replay attacks, key reprogramming and jamming to unlock and ignite the engines of stolen vehicles.

**Signals:**

- **Atypical driving during night-time** – night-time slow or very fast-moving vehicles can signal thieves scanning for suitable targets or driving off with a stolen vehicle. Often such slow-driving vehicles are with non-local plates and with several passengers inside.

- **Night-time activity in locked garages** – such activity may signal about breaking and entering to steal a vehicle.

- **Possession of locksmith or jamming equipment** – possessing such equipment by unlicensed or unauthorised persons might indicate vehicle theft involvement.

- **Jamming of GPS or mobile phone signal in the neighbourhood vicinity** – car thieves frequently use radio frequency jamming, and because of this, prolonged inexplicable loss of GPS signal can indicate suspicious activity.

**Facilitators:**

- **Online traders** – such traders are often unsuspecting facilitators of vehicle crime since many online trade platforms provide easy and unrestrained online sales of ICT tools for car-hacking, such as jammers, ‘virgin car keys’, key programmers, and relay stations. Some of them also have legitimate use such as do-it-yourself repairs or for use by amateur radio operators. The lack of regulations requiring stricter measures when selling such products online allows criminals to purchase equipment anonymously and without risk.

- **Internet fora and channels on social media** – there is free sharing of educational videos and instructions on how to use such ICT equipment to hack vehicle software on the Internet.

- **(Black-hat) hackers** – several interviewed law enforcement experts reported Russian hackers as the main actors in exploring, identifying and breaching vehicle software and
creating hacking tools for unlocking and ignition of vehicles. Some of these hacking tools can be purchased on the darknet. On the other hand, Bulgarian car thieves have had long-time collaboration with Russian criminal networks and smuggled stolen vehicles towards Russia, so they also use personal contacts to acquire such hacking software.

- **Unscrupulous locksmiths** – in some cases, unscrupulous locksmiths offer their expertise or access to specialised tools to crime groups involved in vehicle theft. Some of them specialise in installing hacking software on various devices later used by criminals to unlock or ignite the engine of the stolen vehicles. In Bulgaria, the locksmith profession is unregulated and not subject to licensing, which leaves many of these practitioners in the grey economy zone.

**Partners:**

- **General Directorate National Police (GDNP)** – police (specifically the units on combatting car theft) have the leading role in preventing and countering vehicle crime. They also coordinate efforts and measures with other stakeholders (listed below).

- **Municipal authorities** – local authorities are responsible for city infrastructure and can work towards transforming it into more resilient to vehicle crime.

- **Private security companies** – many private security companies are involved in guarding parking lots of big supermarkets, malls and outlets, which makes them potential partners to police that could pick up signs of suspicious activities and alert police.

- **Locksmith associations** – can be essential partners for increasing accountability and integrity among locksmith professionals.

- **Car manufacturers and car dealers** – both have the primary role in terms of providing regular security patches and upgrades of vehicle software. Currently, the most vulnerable appear to be vehicles manufactured by non-European companies. Car manufacturers can also develop and introduce new vehicle software design that facilitates collection of digital forensic evidence.

- **Insurance companies** – can have an essential role in educating vehicle owners by demanding that they take additional precautionary measures to reduce the risk of theft.

- **Local communities** – local communities and citizens, in general, can be important partners in reporting suspicious activity to the police and taking additional precautionary measures to safeguard their property.

**Barriers:**

- **Increased and enhanced video surveillance** – in cooperation with police, municipal authorities can analyse vehicle theft hot ‘spots’ in their city and invest in increasing CCTV coverage in these areas. The more extensive deployment of the Automatic Number Plate Recognition (ANPR) system, especially in ‘hot spot’ areas, can further increase the detection of stolen vehicles and deter criminals.

- **Securing direct police access to private and public street CCTV footage** – currently, police can request access to CCTV footage, but the procedure is cumbersome, while in a car theft investigation, time is of critical importance. Direct access to CCTV footage can save time and resources and increase investigations’ effectiveness.
Increasing police capabilities for application of digital vehicle forensics – currently Bulgarian police have no such capabilities. Introducing such new forensic methods could substantially improve investigation and collection of evidence.

Investigation and prosecution of vehicle crimes as cybercrime offences – investigating vehicle theft as cybercrime offence can provide an alternative path for collection of evidence and simplify proving of intention. Proof of intention is a huge impediment in investigations of vehicle theft, since according to the Bulgarian legal framework unlocking and even igniting a vehicle is not a proof of intention to steal it and is treated by courts as minor offence.

Jamming detection equipment – increased CCTV coverage can be coupled with deploying jamming detection equipment at key city boulevards or ring road exits.

Increasing security of parking lots in at-risk residential areas – municipal authorities and residents may invest in lighting or (where possible) introduce controlled access to unsecured parking lots. The physical structure of a parking facility can substantially affect the residents’ and store owners’ ability to conduct informal surveillance and guard the vehicles.

Increased police patrolling – increased police patrolling during night-time in ‘hot spot’ areas can help deter criminals.

Tailored training for private security guards at busy public parking lots – developing and introducing specialised training for private security guards can increase awareness about suspicious activities that hint at vehicle crime. Such training can help increase timely alerts to police and help to detect theft attempts at such locations early.

Raising awareness of keyless car owners – targeted information campaign that could be developed and implemented in cooperation with insurance companies and car dealers to raise awareness among car owners on how to protect their cars from such attacks. Vehicle owners could be required or encouraged to take measures such as camera surveillance, wheel locking devices, and protective gear against keyless technologies.

Regular exchange of information between police, car manufacturers and car dealers – car-hacking technologies develop constantly, and regular information from police on brands and models that are particularly vulnerable to specific attacks can help car manufacturers to spot and address vulnerabilities in software with timely updates or other measures.

Mandatory licencing of locksmiths – introduction of mandatory licencing of locksmiths and a single register for these professionals can help better regulate and control the possession, sale and use of specialised locksmith equipment such as key programmers or similar ICT tools. This measure can be coupled with restrictions for the sale, possession and use of such tools by unlicensed physical and legal persons.

Main findings

- The main opportunity factors driving car theft in Bulgaria are the presence of many unsecured parking lots, difficulty in monitoring and controlling suspicious activities at busy public parking lots, vulnerabilities of keyless vehicle technologies, low presence of police patrols in big city residential areas during the night, well-developed city street infrastructure.

- Possible signals for the commission of vehicle crime are: atypical night-time driving, night-time activity in locked garages, possession of car-hacking on jamming equipment of unlicensed persons, and jamming of GPS or mobile phone signal in the neighbourhood vicinity.
- **Key facilitators** of car theft can be unsuspecting stakeholders, such as online traders and social network platforms, or deliberate accomplices, such as hackers developing car-hacking tools and unscrupulous locksmith professionals.

- **Essential partners** to counter car theft are municipal authorities, police, locksmith association, local communities, car dealers and private security companies.

- **Potential barriers** that could be proposed to deter these criminal activities are: increased and enhanced video surveillance, securing direct police access to CCTV footage, introduction of digital vehicle forensics, investigating car thefts as cybercrime offence, deployment of jamming detection equipment at critical nods in the city, increasing the security of parking lots in residential areas, increased police patrolling during night-time, tailored training for private security guards at busy public parking lots, raising awareness of keyless car owners, regular exchange of information between police, car manufacturers and car dealers, and mandatory licencing of locksmiths.

### STEP 5: STORAGE

The fifth step covers the initial hiding of the stolen vehicle and the subsequent relocation to a chop-shop or used-car yard for disassembly or altering the appearance and VIN stamps on the engine and the chassis.

#### Opportunities:

- **Easy access to inexpensive and anonymous storage areas and garages** – the city suburbs of Sofia and the other big cities offer plenty of inexpensive places for storage and garages for rent.

- **Cash payments** – despite the introduced legal thresholds and restrictions for cash payments, cash remains widely accepted. Thus, it creates many opportunities for criminals to preserve their anonymity when renting storage places or garages.

- **Thriving grey economy** – the thriving grey economy allows criminals to rent a property, buy various services without formal written contracts, and make payments without receipts or other paper or digital trails. It also makes easier use of straw persons or intermediaries.

#### Signals:

- **Night-time activity in garages, car-repair shops, used-car yards or storage facilities** – work outside business hours or night-time activities in such places might indicate use as a hideout or chop-shop.

- **Display of unjustified income** – renters of garages or car-repair shops that demonstrate a lifestyle not corresponding with their income.

- **GPS jammers** – presence and use of GPS jammers at garages, car-repair shops, used-car yards or storage facilities are a strong indicator of using the place as a hideout for stolen vehicles.

#### Facilitators:

- **Straw persons** – on many occasions, straw people are used by car thieves to rent property (garages, storage places) in their name. Often these are people with low income and without education.
- **Landlords** – landlords can become unsuspecting facilitators when accepting tenants without contracts and cash payments.
- **Car-repair shops (mechanics, ‘fitters’)** – often, car thieves rely on car-repair shops or trusted mechanics to disassemble the stolen vehicle. Some mechanics also specialise in altering VIN stamps, which is essential to disguise the vehicle’s origin and ownership.

**Partners:**

- **GDNP** – police are the most important factor in preventing and countering vehicle theft crime, as well as in coordinating efforts and measures with the rest of the potential partners since all of this falls in their remit according to the national legislation.
- **Landlords** – landlords can provide important information about suspicious or illegal activities at their property (e.g. garages, storage facilities).
- **National Revenue Agency (NRA)** – revenue authorities can sanction landlords that do not officially register renting contracts to avoid paying taxes.
- **Local communities** – can be valuable partners and report suspicious nightly activities and potential jamming of radiofrequency in their locality.
- **Communications Regulation Commission (CRC)** – currently, CRC and its regional units are the regulatory authorities with vested powers to monitor, inspect and sanction all unauthorised use of radio-electronic equipment that can cause interference or jamming of the radio frequencies. They also possess specialised jamming detection equipment that allows them to establish and localise such unauthorised interferences.
- **Telecommunication companies** – can collect, process and report signals from their clients to police and CRC that may hint at unauthorised radio frequency jamming in a given locality.

**Barriers:**

- **Regular (unannounced) inspections of car-repair shops or used-car yards** – police, in cooperation with revenue authorities, may carry out regular inspections on garages and car-repair shops, with a specific focus on the ones located in industrial areas and small villages near bigger cities.
- **Administrative measures against undocumented renting** – revenue authorities may implement targeted prevention and administrative measures against landlords of garages and storage facilities that avoid taxation. Such measures can include encouraging whistleblowing or targeted campaigns for inspecting landlords and tenants of such venues.
- **Cooperation with CRC and telecoms to identify signal jamming** – police can establish a working mechanism for reporting, inspection and sanctioning radio frequency interference instances. Such a mechanism may help identify illegal chop shops or hideouts of stolen vehicles.

**Main findings**

- The main **opportunity factors** that play at the stage of storage and disassembly are the easy access to inexpensive and anonymous storage areas and garages, the wide acceptance and prevalence of cash payments in the country and the thriving grey economy.
Possible signals to identify such activities are night-time activity in garages, car-repair shops, used-car yards or storage facilities; display of unjustified income by tenants of car-repair shops or storage facilities; and signal jamming or presence of jamming equipment.

Important facilitators of these activities can be straw persons that rent property, unsuspecting landlords that avoid paying taxes and unscrupulous mechanics that help with vehicle disassembly or altering VIN stamps.

Potential partners that could help identify and disrupt activities at this stage are the national police, the national revenue authorities, local communities, telecommunication companies and the Commission for Regulation of Communications.

Possible barriers at this stage include regular (unannounced) inspections of car-repair shops or used-car yards by police authorities, administrative measures against undocumented renting and establishment of working cooperation with CRC and telecoms to identify signal jamming.

**STEP 6: TRANSPORT & TRADE**

The sixth step encompasses the fencing of the stolen vehicles, regardless of whether they are sold for spare parts or as intact vehicles with disguised origins and identities. Both parts and intact vehicles can be sold either domestically or exported to customers abroad. Auto parts are typically sold online and shipped to customers in Bulgaria or neighbouring Balkan countries through postal or shipment companies. Intact vehicles are often ‘cloned’ and exported abroad to countries in the Middle East or former Soviet Union countries. This step may also involve forging documents to disguise the vehicle’s origin and identity, registering the stolen vehicle to a new owner or smuggling it across the border.

**Opportunities:**

- **Well-developed online trade** – most of the stolen vehicles in Bulgaria are disassembled and resold online for spare parts domestically and in the neighbouring Balkan countries such as Serbia and North Macedonia. Because of the massive used-cars park, there is an expansive online used-car auto parts trade. In this regard, fencers rely extensively on well-established platforms for online trade and classified ad websites.  
- **Cheap and speedy postal services** – the country has an extensive and well-functioning network of local postal companies that also offer cheap and speedy shipment of parcels to neighbouring countries.
- **Big used cars market** – the massive used-cars trade (e.g., 85% of the vehicles registered in 2021 were used cars) in the country results in constant inflows and outflows of vehicles. These transnational flows provide opportunities to conceal stolen vehicles among legitimate imports and exports.

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31 A classified website is one of the platforms for online advertising to promote products or services connecting both buyers and sellers in one single entity. Classified portal is customized and distinguished to allow the users to search for relevant categories and sub-categories. Source: https://www.dotline.in/classifieds-web-portal-development.html

32 Capital.bg. The automotive sector in Bulgaria: the new grows, but also ages [Автосекторът в България: новото расте, но и старее]. 21 January 2022. Online at: https://www.capital.bg/biznes/transport/2022/01/20/4303860_avtosektorut_v_bulgaria_novoto_raste_no_i_staree/
- **Proximity and ties to the Middle East, Georgia, Russia and Ukraine** – the country has a favourable geographical position and well-developed road infrastructure that connects Turkey and the Middle East with EU markets, as well as direct ferry lines to Russia, Ukraine and Georgia developed during the 1970s and 1980s. This transport infrastructure provides easy access to markets with a constant demand for high-end vehicles at a reduced price with ineffective or missing oversight on vehicle origin and ownership.

- **Busy border checkpoints** – the border checkpoint ‘Kapitan Andreevo’ is the biggest and busiest land border checkpoint in the EU. The intensive traffic makes it impossible meticulously check all vehicles passing through the border-check point. Similar time and resource constraints face border authorities at the ports of Varna and Burgas that exercise border controls over the ferry lines.

- **Police corruption** – in Bulgaria, new owners are required by law to register their newly acquired vehicle with the police, where along with a document check, vehicle VIN stamps are visually inspected and cross-checked with submitted documents. However, because of the burdensome and time-consuming administrative procedure, the process has long been plagued by petty corruption. Criminals also take advantage of the existing corruption-ridden environment to evade controls and legally register stolen vehicles using forged documents.

**Signals:**

- **Suspiciously low prices of spare parts or used vehicles** – online stores or physical persons offering used vehicles or car parts with discounts that deviate suspiciously from the typical price range may signal the sale of stolen vehicles or parts.

- **Missing or not original documents** – car parts sold without proper documents from the manufacturer or vehicle sold with missing or not original documents for registration or purchase.

- **Cash payments** – seller accepting only cash payments.

- **Cars or car parts from specific brands and models at border checkpoints** – cars or parts of specific brands and models destined for the Middle East or former Soviet countries signal a higher risk of smuggling stolen vehicles. Such risk profiles are usually prepared and disseminated by international institutions such as Interpol, Europol and national police.

- **Tempered or altered VIN stamps** – mismatching VIN stamps on the engine and the chassis and signs of tempering the VIN stamps also indicate a stolen vehicle. Often tempering of VIN stamps can be discovered only with specialised equipment.

**Facilitators:**

- **Classified ads platforms** (such as Facebook Marketplace, mobile.bg, and olx.bg) – classified ads website owners are among the unsuspecting facilitators of stolen vehicles and stolen auto parts fencing. Such online platforms publish thousands of ads on used car parts and are also popular with car thieves.

- **Shipping/postal companies** – similarly, postal companies unsuspectingly facilitate the transport of stolen car parts across the country or to neighbouring countries, often to unaware buyers.

- **Used-car and auto salvage yard owners** – in many cases, stolen vehicles or vehicle parts are sold to used-car and auto salvage yard owners with or without their awareness. Some owners act as fencers and directly place orders for certain vehicles or parts from specific brands and models.
- **Document fraudsters** – document fraud is integral to fencing stolen vehicles and vehicle parts. Document fraudsters may not directly participate in the criminal group but rather provide crime-as-a-service.
- **Corrupt police officers** – in many cases, stolen vehicle registration is made possible with the aid of corrupt police officers. They may secure lenient visual inspection of the vehicle during its registration to a new owner.

**Partners:**

- **GDNP – GD National Police** primarily investigates vehicle theft and stolen vehicle sales. The traffic police department within the National Police is also responsible for exercising control over the registration of vehicles, including change of registrations in case of ownership change. Therefore, they have administrative and law enforcement powers to disrupt the fencing of stolen vehicles.
- **National Customs Agency** – NCA has an essential role in controlling the import and export of all goods across national borders, including vehicles and vehicle parts. Through more effective cooperation with national police, they can enhance risk profiling to prevent the smuggling of stolen vehicles and vehicle parts.
- **General Directorate Border Police (GDBP)** – border police exercise control over persons and vehicles entering and exiting the country and have an essential role in detecting stolen vehicles smuggled across the border.
- **Directorate Internal security at Mol** – the Directorate might introduce targeted measures at teams responsible for physical inspection of vehicles undergoing registration by traffic police units.
- **Notaries** – in Bulgaria, there is a legal requirement for all transactions for the transfer of vehicle ownership to be notarised. In this regard, notaries are essential in deterring fraud and document forgery.
- **Classified ad platforms and postal companies** – these actors often act as unsuspecting facilitators of fencing stolen vehicles and vehicle parts. However, they can also act as partners to effectively disrupt this activity by introducing or improving their mechanisms to identify customers (KYC procedures).
- **Used-car and auto salvage yard owners** – apart from facilitators, used-car and auto salvage yard owners could also be partners in curbing vehicle theft, for example, by introducing more robust checks on sellers about the origin and ownership of vehicles and vehicle parts.

**Barriers:**

- **Mobile X-Ray scanning equipment for checking VIN stamps** – purchase of specialised X-Ray scanning equipment for traffic police units and border police units at border checkpoints is a promising preventive measure. Such equipment can enhance the effectiveness of VIN checks of vehicles during registration or at border checkpoints.
- **Electronic register of the notarised power of attorney documents** – notaries can upgrade their electronic system also to include records of issued dispositive power of attorney documents. The current electronic system of notaries in Bulgaria allows them to check all other relevant registers (e.g. the population register, the traffic police vehicle’s register, the commercial register, the tax register, the national insurance guarantee fund
register, the register for liens and attachments on the property), before notarisation of vehicle purchase and sale agreements.

- Anti-corruption measures targeting teams for a physical inspection of vehicles under registration – traffic police units responsible for the physical inspection of vehicles as part of the registration process often are exposed to corruption pressure. GD National Police and Internal Security Directorate may elaborate procedures for risk assessment and targeted investigations of these teams.

- Enhancing inter-institutional cooperation at BCPs – regular exchange of information between national police, border police and customs authorities to regularly update the risk profiles applied during border checks.

- Regulation of the auto salvage yards sector – auto salvage yards largely function in the grey economy and are an essential conduit for the sale of stolen vehicle parts. Introducing stricter regulations such as licencing, stricter rules and sanctions for purchasing, storing and selling car parts without proof of origin can substantially reduce the fencing of stolen vehicle parts.

- Enhancing KYC procedures at classified ad platforms – regulation or self-regulation of such platforms concerning better identification of their users can help identify malafide users and thus discourage the sale of stolen goods.

- Increasing compliance with KYC procedures at postal companies – postal companies may take measures to increase compliance with KYC procedures by their staff through training, control and internal sanctions.

Main findings

- The main opportunity factors that play at the stage of transport and trade are the well-developed online trade and postal services, the existence of cheap and speedy postal services, the big used cars market, the proximity and ties to big markets of stolen vehicles such as the Middle East, Georgia, Russia and Ukraine, busy border checkpoints, and police corruption.

- Possible signals to identify such activities are suspiciously low prices of auto parts or used vehicles, missing or not original documents, cash payments, cars or car parts from specific brands and models at border checkpoints, and tempered or altered VIN stamps.

- Important facilitators in transport and trade are classified ads platforms, shipping/postal companies, car and auto salvage yard owners, document fraudsters, and corrupt police officers.

- Potential partners that could help identify and disrupt activities at this stage are GD National police, National Customs Agency, GD Border police, Directorate Internal security at MoI, notaries, classified ads platforms and postal companies, and used-car and auto salvage yard owners.

- Possible barriers at this stage include equipment of traffic and border police units with mobile X-Ray scanning equipment to check VINs; the establishment of an electronic register for the power of attorney documents by the Notary Chamber; anti-corruption measures targeting teams for physical inspection of vehicles during registration; enhancing inter-institutional cooperation at BCPs; regulation of the auto salvage yards sector; enhancing KYC procedures at classified ads platforms; increasing compliance with KYC procedures at postal companies.
STEP 7: PROFIT

The last step covers money laundering related to vehicle theft. The collected data did not identify any specifics related to laundering proceeds from this particular criminal activity, so this part of the barrier model can also apply to other types of organised crime.

Opportunities:

- **Cash-intensive economy and massive grey sector** – the extensive use of cash in everyday transactions and the grey economy greatly facilitate the laundering of illicit proceeds.

- **Insufficient compliance with anti-money laundering (AML) requirements** – Bulgarian AML legislation is harmonised with the EU legal framework. However, compliance with the legislation is still not robust. Many reporting entities, such as real estate brokers, often overlook AML legal requirements on the origin of funds and suspicious transactions.

Signals:

- **Display of unjustified income** – collected data suggests that car thieves usually spend the proceeds on maintaining luxurious lifestyles.

- **False invoices, mismatching records** – fencing of stolen vehicles or vehicle parts often occur alongside legitimate business trade, such as used-car or auto salvage yards, which are used as fronts for illegal activities. Mismatching storage and accounting records, fake invoices or invoices from bogus companies may signal transactions with illicit proceeds or laundering of illicit proceeds.

Facilitators:

- **Accountants or accounting firms** – falsifying financial documents requires a certain level of financial expertise, so in many cases, criminals rely on experts with accounting expertise to launder illicit proceeds.

- **Real estate agencies** – real estate investments remain the preferred way of money laundering in Bulgaria, and in such cases, real estate agents may act as facilitators.

Partners:

- **National Revenue Agency** – NRA may flag certain irregularities discovered during used-car and auto salvage yard owners’ tax audits. Such flagged irregularities might prove helpful in detecting money laundering.

- **General Directorate Combating Organised Crime (GDCOC -money laundering unit)** – may provide valuable support in tracking money laundering transactions.

- **State Agency National Security (SANS)** – SANS host the national financial intelligence unit (FIU) and it may develop a risk assessment of suspicious transactions related to vehicle theft and sensitise obliged entities to monitor and report.

- **Obliged reporting entities** – obliged reporting entities under the Act on Anti-money Laundering Measures may improve collaboration with FIU to flag and report suspicious transactions more effectively.
Barriers:

- **Parallel financial investigations** – parallel financial investigations are strongly recommended by Europol and FATF, although rarely utilised by Bulgarian authorities. Building capacity and prioritising parallel financial investigations may better deter money laundering related to vehicle theft.

- **Improving the effectiveness of asset tracing, seizing and confiscation** – CACIAF has gained lots of experience in tracing and seizing illicitly acquired assets, although there is still room for improvement. Linking parallel financial investigations and asset tracing can help early identification and freezing of criminal assets.

- **Risk assessment of suspicious transactions related to organised vehicle theft** – SANS can assess patterns, sectors at risk and potential red flags to better coordinate and target preventative measures for curbing money laundering related to organised vehicle theft.

- **By strengthening compliance oversight over legally obliged reporting entities** – drawing on a risk assessment of sectors at risk for money laundering related to organised vehicle theft, SANS may introduce additional training and regular inspections for obliged entities in those at risk.

**Main findings**

- The main **opportunity factors** at this stage are the cash-intensive economy, the massive grey sector, and the insufficient compliance with anti-money laundering requirements by the legally obliged entities.

- Possible **signals** to identify such activities are displaying unjustified income and false invoices or mismatching records in the accounting books.

- Important **facilitators** at the profit stage can be actors such as accountants or accounting firms and real estate agencies.

- Potential **partners** that could help identify and disrupt activities at this stage are the NRA, GDCOC with its money laundering unit, SANS with its focal intelligence unit, and the **obliged reporting entities as per the Act on Anti-Money laundering measures, and CACIAF**.

- Possible **barriers** at this stage include building capacity and prioritising parallel financial investigations, improving the effectiveness of asset tracing, seizing and confiscation, Risk assessment of suspicious transactions related to organised vehicle theft, and strengthening compliance oversight over legally obliged reporting entities.

**DISCUSSION**

The constructed Bulgarian barrier model has **inherent limitations** that future researchers and policymakers must consider. They are related to the model’s scope, the reluctant stakeholders, the direct and indirect costs of proposed administrative measures to citizens and businesses, and the need for periodic review, assessment and update of the proposed measures.
The **scope of the proposed barrier model** is limited only to the offense of car theft. The collected data suggest that vehicle crime is generally related to two types of crime - vehicle theft and insurance fraud. However, the more significant part of the recorded offences is related to car theft. These two types of crime have crime scripts that may partially overlap, mainly in the stages related to the transport and sale of the vehicle. Nevertheless, these similarities do not allow the applicability of the same barrier model to both types of crime. Therefore the presented barrier model focuses exclusively on car theft.

**Reluctant stakeholders** proved to be a big challenge in building the Bulgarian barrier model. The Bulgarian barrier model's analysis and construction relied on in-depth stakeholder interviews. However, a limited number of stakeholders agreed to participate, namely the General Directorate National Police, the General Directorate Border Police, the National Customs Agency, the Prosecutor's Office, representatives of the insurance sector, the Association of the Locksmiths in Bulgaria, the Notary Chamber of Bulgaria. Important stakeholders such as car dealers, online commerce platforms and postal companies did not agree to participate. Therefore many of the suggested measures could not be consulted and validated with them. In addition, other relevant stakeholders were identified during the research, such as municipal authorities, the Communications Regulation Commission, telecommunication companies, the Commission on anti-corruption and confiscation of illegally acquired property, and State Agency National Security. The initial methodology of the study did not include these stakeholders. The comprehensiveness and effectiveness of such a barrier model largely depend on the inclusion and active engagement of all relevant stakeholders.

Furthermore, the proposed barrier model does not fully consider the measures' direct and indirect costs to citizens and businesses. The validation of the model by the involved stakeholders can, to some extent, take into account the costs and prioritise specific measures, but it does not include robust methods for the ex-ante evaluation of these costs. Several experts have already discussed the costs of preventive measures during the interviews (LEO-10). Most often criticised were two of the administrative measures introduced by the Bulgarian authorities in the early 2000s: 1) the mandatory physical inspection of the vehicle’s VINs during registration of the vehicle to a new owner; 2) the mandatory notarisation of each vehicle’s purchase and sale agreements. The criticisms against the first measure relate to the unnecessarily slowing down the registration process of new owners, which results in unjustified loss of business or productive working hours. The criticisms against the second measure focus on unnecessarily imposing additional tax over a standard business transaction. The downward trend and low rates of vehicle crime in the Bulgarian context suggest that the cost of the administrative measures outweighs the societal harm brought by car theft, and some of the existing administrative measures can be relaxed or removed.

Finally, the proposed barrier model reflects the current modus operandi, trends, opportunities and facilitators of vehicle crime. However, criminals adapt and develop as the environment and

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opportunities change. Therefore, the proposed barrier model needs periodic review, evaluation, and update to remain adequate and effective.

**Most important lessons learned**

The Bulgarian barrier model has several inherent limitations:

1. **Scope of the proposed barrier model focused only on car thefts.**
2. **Reluctant stakeholders** do not allow comprehensive analysis and proper validation of the model.
3. The proposed model **does not take into account direct and indirect costs for implementing the identified barriers.**
4. In order to remain adequate and effective, **the proposed barrier model needs periodic review, evaluation and update.**

**Conclusion**

In the last twenty years, vehicle crime in Bulgaria contracted tenfold, and it is no longer a significant criminal threat as it used to be in the 1990s. Many factors contributed to this – the economic growth and the substantial increase of household income right before and after the country acceded to the EU, the new technological developments in vehicle security and the various administrative measures by the Bulgarian authorities to curb the stolen vehicles market.

The recorded vehicle crime offences in the last five years remain small in number, but the value of stolen vehicles increased. Vehicle crime became predominantly organised, using intensively various ICT tools and targeting high-end vehicles. Thus it remains an important organised crime threat in Bulgaria.

The barrier model approach applied in this study proved a helpful tool to understand the modus operandi, enabling factors and facilitators driving this crime better. It also allows identifying partners and measures to more effectively target each of these factors and the crime itself and lay the ground for a comprehensive prevention strategy for this type of crime.

The first implementation of the barrier model in the Bulgarian context also identified several important limitations. These limitations could serve to develop further and improve the barrier model methodology.

**Most important lessons learned**

- Vehicle crime in Bulgaria decreased tenfold over the last twenty years.
- The decline in vehicle crime was accompanied by increased organised crime involvement, use of ICT tools and a higher average price of stolen vehicles, thus preserving it as an important threat.
- The barrier model proved a useful analytical tool in the Bulgarian context.
- The implementation of the approach also led to the identification of several important limitations of the barrier model, which should be taken into account to develop further and improve the methodology.
German barrier model case study

Introduction

Germany is among the major producing and exporting countries of motor vehicles in the world (Verband der Automobilindustrie 2022). Germany is also a country that heavily relies on motor vehicles for transportation. In 2022, a new all-time high in the number of registered motor vehicles was reached with a total of 59.6 million, including cars, trucks, buses, motorcycles, agricultural and other special motor vehicles. Passenger cars alone account for 48.5 million vehicles. This equates to a relatively high motorization rate (number of passenger cars per 1,000 inhabitants) of 584 (Kraftfahrzeug Bundesamt 2022a; see also ACEA 2022).

The domestic car market in Germany is characterized by a considerable popularity of premium cars. 27.8 percent of the 2.6 million cars newly registered in the year 2021 were models of Germany’s major premium car manufacturers Audi, BMW, Daimler and Porsche (Kraftfahrzeug Bundesamt 2022b). Also significant is the high share of SUVs and all-terrain vehicles, accounting for 25.4 percent and 10.7 percent, respectively, of newly registered cars in 2021 (Kraftfahrzeug Bundesamt 2022c).

In contrast to the high number of desirable motor vehicles in use in Germany, the number of motor vehicles stolen has declined to historic lows far short of the levels that had been reached in the 1990s following German reunification. The annual Police Crime Statistics published by the German federal police agency Bundeskriminalamt (BKA) show the number of cars registered as stolen or illegally used per year exceeding 200,000 in 1993 and in 1994. Since then, numbers have dropped to below 50,000 cars illegally taken per year since 2006, and below 30,000 since 2019. Correspondingly, the number of identified suspects has declined from levels of close to 40,000 per year in the mid-1990s to under 10,000 per year since 2013 (Fig. 1). A decline is also discernible with respect to the total value of motor vehicles reported stolen. According to the German association of insurance companies, GDV, the total value of stolen cars covered by insurers in 2021 was 187 million Euro, compared to 323.7 million Euro five years earlier in 2017 (GDV 2022a). Private and public sector experts interviewed for this report tended to describe the current situation as the bottom that one has to live with.
Of the motor vehicles stolen in Germany it is possibly only a smaller share which is trafficked in whole. The majority of vehicles may be stripped and sold in parts. According to estimates of experts interviewed for this study, at least half and up to 70 or 80 percent of stolen motor vehicles are salvaged for parts (C24A; B08A; D02A). One expert suggested that vehicles up to three years old will be sold in whole because of a lack of demand for spare parts. In contrast, with respect to vehicles six to ten years old, the marketing of salvaged parts dominates (A22A). In the long-term, navigation devices and airbag control units are most in demand (BKA 2022, 9; Wannevitz 2017, 13; Zöls 2015, 4). In addition, parts which need to be replaced after a collision (bumper, radar sensors, airbags, steering wheels), or parts which increase the value of a car (e.g., entertainment components and xenon headlights) are preferred targets of theft (C24B). Catalytic converters are specifically targeted for the precious metals used (A17A; C24B; A22A).

While the majority of offenders holds German citizenship, the trafficking in stolen motor vehicles is primarily attributed to offender networks rooted in Eastern European countries, namely Poland, Lithuania, Bulgaria and Ukraine, as well as various West African countries. Offenders employ different schemes in the theft of motor vehicles. In the case of leasing and rental cars, offenders have access to the original key, which in 2019 accounted for 13.8 percent of the cases of illegally taken cars, with an upward trend since then (BKA 2020, 5; BKA 2022, 2). Cars falsely reported stolen by the owner to defraud insurers in cases where the insured value exceeds the market value of the vehicle also continues to occur (Thietz 2010, 28; A17A). In cases where motor vehicles are illegally taken without the original key – which according to one expert (C24A) only applies to less than 50 percent of cases – three different methods are applied. The oldest and currently rather rare method is to mechanically open a car with a tool resembling a hardened key blank commonly dubbed ‘Polish key’ (Thietz 2010, 32) – formally Kfz-Kraftschlüssel – to gain access to the on-board diagnostics port (OBD). Through the OBD, a key can be electronically programmed to start the engine (A22A; A24A; C24B). The most common method over the past 10 years, especially with respect to the theft of premium cars, exploits weaknesses in keyless systems, which allow a car to be opened and operated with a transponder without having to insert a key. Offenders launch so-called relay attacks which involve offenders picking up and relaying the signal of the transponder to the car using a set of two devices held close to the car and to the transponder, respectively (Francillon, Danev & Capkun 2011). The vehicle can be opened and operated, because the start-
stop-system, which is installed as standard deactivates the car immobilizer once the door is opened seemingly legitimately (A17A). A third method which has emerged over the past two years involves the use of so-called Gameboy tools which are handheld devices freely marketed on the internet and which enable offenders to quickly open and set in motion cars of specific makes and models without causing any physical damage. In contrast to relay attacks there is no need when using a Gameboy tool to program a key to restart the car after the engine has been turned off (BKA 2022, 13; A24A).

The theft of cars follows a crime script including distinct steps. Prior to the actual taking of a car, the locations of potential crime targets are identified, partly using GPS trackers. Technically skilled offenders open the targeted motor vehicle mechanically or electronically and make it ready to drive. Courier drivers then bring the vehicle directly across the border unless it is left at a place nearby to let it ‘cool off’ first. Commonly, stolen vehicles are only disassembled or sold in whole outside of Germany. For vehicles that are sold in whole, false documents are being created and new keys are being programmed (A24A).

Most stolen vehicles are disassembled in Poland or other East European countries (A24A; D02A; Wannewitz 2017, 19-20). Vehicles and vehicle parts stolen in Germany resurface globally (A24A), for example at a gigantic open-air market in Duschanbe, the capital of Tajikistan (A22A). Three main trafficking routes are identified: (1) overland to Eastern Europe and Central Asia, (2) by ship to North- and Westafrica, and (3) by ship to the Middle East, from where markets in the region and in Southeast Asia are supplied (BKA 2022, 13). It is difficult to ascertain, given the low clearance rate, to what extent the marketing of stolen vehicles and vehicle parts also takes place in Germany. Reportedly, fraudulently obtained leasing cars are sold through online platforms such as Autoscout24 to bona fide buyers. The cars are advertised as accident cars at low prices and come with forged papers, partly using stolen blank documents (BKA 2022, 10; A17A). Vehicle parts are also offered to customers in Germany on platforms such as eBay, Allegra and Alibaba (Zöls 2015; B08A; C24A). In addition, cars stolen in other countries are registered in Germany using false documents or documents from wrecked cars and, according to the Bundeskriminalamt, are then marketed in other countries (BKA 2022, 10; A17A).

The Bundeskriminalamt assumes that the trafficking in stolen motor vehicles is primarily the work of hierarchically structured, internationally networked offender groups (BKA 2022, 13). This does not mean, however, that all offenders in the supply chain operate within one organizational framework. For example, offender groups based in Poland or Lithuania which specialize in the processing of stolen motor vehicles may draw on different cross-border mobile groups of thieves for supply (A17A; A24A). The typical gang of thieves consists of at least three to four individuals. In the case of more complex structures, the organizers are usually insulated by intermediaries from the car thieves and courier drivers (D02A), so that only a small number of high-ranking individuals have an understanding of the overall operation (BKA 2022, 13). Most participants specialize in specific subtasks and insofar tend to be quite skilled. Courier drivers, however, are typically only recruited to transfer one or two vehicles to minimize the risk of exposure of the larger operation. These individuals are often in need of money and are not expected to have special skills (A24A; D02A; B08A; C24A). Only in some cases, courier drivers are recruited for their driving skills and may have a background in rally driving (A22A). The development of the hardware and software needed to steal cars, however, is believed to require the knowledge and skills of engineers (A24A; C24A). Some very talented technicians are believed to operate in Bulgaria (A22A). Overall, however, only very
limited insights about offender structures and trafficking routes abroad exist among experts in Germany (Bo8A), except that fences play a crucial role in connecting the procurement level in Germany and the distribution level in other countries (A17A).

In Germany, motor vehicle crime falls under three basic criminal offense categories: theft, embezzlement, and fraud. The German Penal Code (StGB) distinguishes three types of theft, (1) theft without aggravating circumstances (sec. 242 StGB), (2) aggravated theft (sec. 243 StGB), including, for example, commercial theft, and (3) gang theft (sec. 244 StGB). Experts assume that offenses in the area of motor vehicle crime commonly qualify as gang crimes (A24A; A22A; C24B). The illegal taking of rental cars and lease vehicles usually falls under embezzlement (sec. 246 StGB) or fraud (sec. 263 StGB). All three basic constellations tend to be connected to the subsequent offense of fencing (sec. 259 StGB) (BKA 2022, 9; Thietz 2010, 31-47; A24A). Also typically involved are offenses of manufacturing false documents and license plates, and the use of false license plates (sec. 267 StGB), and possibly, in case courier drivers seek to avoid road blocks, reckless endangerment (sec. 315c StGB). In light of the various pertinent criminal offenses and of the fact that statistics are not broken down according to phenomenological categories, it is not possible to present specific data on the number of indictments and convictions for motor vehicle crimes.

The economic impact of motor vehicle crime is born by the general motorized public through insurance premiums. Victims of car theft are covered under basic insurance policies. In addition, a majority of stolen motor vehicles is not registered to private citizens but to businesses (D02A). This may explain why, according to the experts interviewed for this study, there is no build-up of pressure on politics and legislation to do something about car theft and, compared to other areas of crime, little importance is given to motor vehicle crime (A17A; A24A; B08A; C24B; D02A).

**Main findings (for dissemination)**

- Motor vehicle crime continues to be committed in organized fashion.
- The most important offender strategy is to exploit weaknesses in the keyless technology.
- Motor vehicle crime is not perceived to be a major crime problem given that damage is largely socialized through insurance.
Barrier Model

The proposed barrier model for the prevention of organized vehicle theft and stolen vehicle parts in Germany consists of technological barriers for the tracking of stolen motor vehicles and the identification of stolen vehicle parts, improved factory-fitted anti-theft technology, administrative and legal barriers to reduce opportunities for registering stolen cars through ‘car cloning’, and, most importantly, barriers in the form of intersectional and international information exchange and cooperation.

STEP 1: ENTRY

Creating barriers for entry of cross-border mobile offenders into Germany is difficult and problematic. On the one hand, some of the actors, both from EU countries (primarily Poland, Lithuania, Bulgaria) and from non-EU countries (primarily Ukraine and West African countries), are already legally residing in Germany. On the other hand, Germany and all nine neighbouring countries are part of the Schengen area with free movement of people. These caveats notwithstanding, there are indications that border controls could limit theft. When borders were closed in 2020 due to the Corona pandemic, there was a drastic drop in the number of stolen motor vehicles in Germany (A17A; A24A; B08A). The problem in times of normal cross-border travel is, how to identify offenders upon entry, which is difficult unless they have theft tools clearly visible in their car (A17A). Investigative leads result primarily from information shared by foreign partner agencies, e.g. on the repeated use of certain foreign car rental companies by the same offender group (B08A). This is not a standard pattern, however, as offenders often borrow cars from within their social network for trips to Germany (A17A). Even when entering the country by public transport (bus, train), there are hardly any suspicious signals. Even if the perpetrator and the region of origin are known, it is deemed unlikely that this leads to preventing a perpetrator from entering the country and committing crimes (A24A).

Main findings (for dissemination)

- Some of the perpetrators are permanent legal residents in Germany, so that entry into Germany to commit crimes is not an issue.
- Cross-border mobile offenders cannot be prevented from entering the country, since there is free movement of people between Germany and its neighbouring countries within the Schengen area.
- Knowledge of the entry of certain perpetrators is usually only gained through international police cooperation.

STEP 2: STAY

In most cases of cross-border mobile offenders, staying in Germany does not appear to pose any particular logistical challenges. Apart from the perpetrators who have a permanent place of residence in Germany with family ties and legal residence status – namely so-called residents – cross-border mobile offenders usually only stay in Germany for very short periods of time (A17A; A24A; B08A). Thieves and couriers entering from Poland typically travel to Germany on the day, or the day before the theft and spend the night in their car, and then transfer the stolen vehicle across
the border (A17A; A24A). Cases in which criminal groups set up bases of operation in Germany for several days or weeks are rather rare. They stay in small hotels or at apartments provided by residents (A17A; A24A; B08A). In one case, a Polish–Ukrainian group legally acquired and remodelled a homestead in a village to live there and for use as a base for criminal activities (B08A). Barriers to staying in Germany are therefore difficult to erect. Hotels could report foreigners staying just one night or checking out in the middle of the night. But this form of surveillance is considered undesirable for the population and for the police (B08A).

### STEP 3: INFRASTRUCTURE

The road infrastructure plays a central role in the theft and transportation of motor vehicles. Access by motorway is important for the selection of areas of operation and the structure of the motorway network has a decisive influence on the routes for bringing stolen motor vehicles across the border (A24A; B08A; A22A; D02A). According to experts, the lack of infrastructure for automated traffic surveillance, namely license plate recognition cameras, has a beneficial effect for MOCGs (B08A).

Overseas ports are becoming increasingly important for the shipment of stolen vehicles abroad. Here, vehicles are shipped either in whole or dismantled without exports being systematically or specifically inspected by customs. Checks are only occasionally carried out on suspicion (A24A; A17A).

### Main findings (for dissemination)

- Offenders stay legally in Germany short term and long term.
- Offenders who come to Germany for short periods of time can usually rely on a support infrastructure in Germany or they operate independently (e.g. sleeping in their own vehicle).
- Barriers erected to prevent people from staying in Germany could violate fundamental and human rights and are also not desired by the police.

### STEP 4: CRIME

As described in the introduction, vehicles are often stolen using the original keys. In the event of theft without an original key, there are essentially three approaches: 1) vehicles are opened mechanically in order to gain access to the OBD interface, 2) keyless technology is overcome with relay attacks and 3) so-called Gameboy tools are used to unlock and start the vehicles. Keyless technology continues to be a security vulnerability (A22A; A24A; D02A). Of the more than 530 motor
vehicles with keyless systems that were recently examined, the vast majority – around 95% – are not protected against attacks with extended radio links (ADAC 2022), although the problem has been known since 2011 (Francillon/Danev/Capkun 2011) and effective security measures in the form of ultra-wideband technology are available (Zivadinovic 2019; A22A). The various theft tools are relatively easy to obtain on the internet and affordable for offender groups (A17A; A22A; B08A).

In the case of OBD attacks, damage to the door lock or a smashed side window could be a theft signal. Indications of theft through relay attacks would be a running engine during a roadside check or at the gas station, since the transponder providing the radio signal is out of range (B08A). Signals for car theft would also be visible theft tools in the car, which offenders try to avoid, however, or high value vehicles in particular parking spaces that thieves prefer for the cool-off stage (A24A).

A number of actors – law enforcement agencies, politicians, manufacturers, legislators and insurance companies – could inadvertently assume the role of facilitators. Law enforcement authorities and political leaders reduce pressure on offenders by prioritizing other areas of crime (Dietlin 2013; A17A; A24A). Manufacturers create or maintain security vulnerabilities by design (B08A; C24B). EU legislators help criminals to exploit certain vulnerabilities more easily under EU competition law by guaranteeing independent garages access to diagnostic tools, which could also make it easier for criminals to use these tools to steal cars (A17A). Indirectly, insurers promote theft and ‘car cloning’, since they insist on accident-damaged cars being sold on the salvage market. This way, perpetrators can obtain legal papers and serial numbers that can be transferred to stolen vehicles (so-called duplicate vehicles). Insurers could erect a barrier against duplicates by organizing the recycling of leftovers from accident cars without vehicle registration and title (A17A; A22A; A24A; C24A; C24B). Insurers have already indirectly created a barrier by raising insurance premiums on easily stolen vehicles or cautioning the respective manufacturers of the possibility that they might refuse to insure these models at all. In one case, this has prompted a manufacturer to install a tracking device, which led to a decrease in the number of thefts of this particular model (A22A). This tracking devise could not (yet) be deactivated or circumvented.

As an effective individual barrier, it still helps to park high-value vehicles in a carport or garage, or underneath a street lamp. The transponder for keyless systems should be stored away from doors and windows in a signal-blocking container, e.g. an aluminium box (A22A; A24A). The conventional immobilizer and steering-wheel lock also have at least some deterrent effect (ACE 2021: 18; A22A; C24B).

Manufacturers could add and improve security features to make it more difficult to open and steal their vehicles (A17A; B08A). For example, only some keyless transponders can be manually switched off to foil relay attacks (D02A). Experts also recommend that manufacturers should limit access to the OBD port to certified specialists and that the port should automatically shut down in the event of unauthorized access (C24B). A shitstorm on social media also acts as a barrier, since reputation and image are very important to manufacturers (C24B; C24A). In this context, the English rating institute Thatcham has gained increasing relevance. German manufacturers present their new models for certification, which is believed to influence both brand reputation and purchasing decisions of customers (C24A; C24B).

Individual serial numbers constitute a barrier for the theft of parts especially when they are integrated into the networked component protection of the vehicle with their own intelligence,
control and electronics (C24B; C24A). The fact that an affected German manufacturer now supplies a navigation system as basic equipment in many cars on the Chinese market, which had previously been illegally requested (C24B), has proven to be a barrier to navigation system theft. A completely new navigation system was installed in a previously theft-prone model, resulting in a 99% reduction in the number of devices offered on eBay (C24B).

Law enforcement agencies can act as barriers in a number of ways. An important point is basic and advanced training across the police force. For example, the Bundeskriminalamt and the state police agencies have set up organizational units that specialize in automotive IT and that police officers can consult (A17A). Continuing education publications help to multiply knowledge about motor vehicle theft (A24A). More resource-intensive investigations that more exhaustively expose offender structures would allow access to the higher organizational levels of MOCGs (A17A). In addition, cooperation with vehicle registration offices, the Federal Motor Transport Authority, non-profit automobile associations, insurance companies, manufacturers, importers, dealers, and car service businesses can enable the transfer of knowledge about new modi operandi (A17A; A22A; A24A; B08A; C24A). The same applies within the police with respect to information sharing between forensic technicians, investigators, and analysts (A17A). German investigators also consider it extremely helpful to work with agencies from the regions of origin of offenders (Dietlin 2013; Thietz 2010; A24A; B08A; D02A). The vehicle identification database EuFID, the Schengen Information System and the INVEX project or the Interpol ASF system were also considered effective by experts (A17A; B08A; C24A).

If regulations for stricter theft protection are passed, then this should be at least at the level of the EU or in the form of a UNECE regulation that applies in most parts of the world (C24B).

A seasonal barrier to motor vehicle crime in Germany can be observed twice a year when car thefts decline around the Easter and Christmas holidays (A24A).

Main findings (for dissemination)

- Motor vehicle crime is cross-border crime, in which the theft of the vehicles takes place in Germany, but the vehicles are modified, dismantled and marketed elsewhere.
- Sophisticated technology is used to overcome mechanical and electronic anti-theft protection.
- German law enforcement agencies rely heavily on international cooperation to develop leads and to successfully bring charges against perpetrators.

STEP 5: STORAGE

The storage requirement for motor vehicles stolen in Germany is limited. Typically, the vehicles are immediately moved across the border and otherwise, only little storage space is needed given that offender groups only handle a few vehicles at the same time. When stolen cars are left in Germany for short periods of time to ‘cool off’, they are usually parked publicly in the street with GPS transponders deactivated, especially in industrial areas, where large numbers of cars are parked and no parking management exists (A17A). Through surveillance experience, some criminal investigators have identified preferred typical parking locations for cool-off stages (e.g. industrial areas, certain public parking lots) and shared this pattern recognition (A24A). In some cases, vehicles are stored out of sight, for example in sheds or in garages in anonymous rental garlic parks (B08A;
D02A). People who would want to rent larger storage spaces on the sly would have a signal effect. Former facilities of the Red Army were used by perpetrators but are now being systematically checked by the police (A17A). Lessors of premises with high-voltage connection where vehicles can be dismantled would function as facilitators.

<table>
<thead>
<tr>
<th>Main findings (for dissemination)</th>
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</thead>
<tbody>
<tr>
<td>- The majority of offender groups are not dependent on storage facilities in Germany because they quickly bring stolen motor vehicles abroad and only handle a few vehicles at a time.</td>
</tr>
<tr>
<td>- When cars are not immediately brought abroad they are mostly parked in public and only in a few cases in garages or other storage facilities.</td>
</tr>
<tr>
<td>- Pattern recognition based on typical parking locations, e.g. industrial areas, and surveillance of locations that have been identified as preferred parking locations for specific groups of perpetrators can serve as barriers to the storage of stolen vehicles.</td>
</tr>
</tbody>
</table>

**STEP 6: TRANSPORT & TRADE**

Due to the proximity to open international borders, the majority of vehicles leave the country on their own four wheels and are marketed elsewhere (A22A). When moving the vehicle overland on its own wheels, stolen or falsified license plates are often used for camouflage (A17A). Stolen vehicles are also exported via the Port of Hamburg. Customs or port officials are named as unintentional facilitators who, due to the massive volume of exported goods, cannot assure the inspection of all containers (A17A; A22A). In some cases, port employees may be involved in the criminal shipping of vehicles and vehicle parts (BKA 2022, 15). Overall, it is relatively easy to bring luxury vehicles outside the EU without inspection (A17A).

Depending on the method of theft, damaged door locks or a smashed side window could be signals for the transport of stolen vehicles, or a running engine during a traffic stop or when refuelling (A22A; A24A; B08A). Another signal that detectives identify is when the driver and vehicle do not seem to match, namely when there is a contrast between the age and appearance of the driver and the value of the vehicle. Officers also draw on ‘police intuition’ and experience (A22A; B08A). When perpetrators hire legal transport companies for transport, a tell-tale sign is when shortly before reaching the agreed destination, the instruction is given by phone to unload in the street (A17A). Shipping companies cannot be made accomplices because they are usually reputable businesses. Nonetheless, there are certain trucking companies that are apparently set up for the sole purpose of providing logistical support for the trafficking in stolen motor vehicles (A17A; B08A).

Facilitators for the resale of car parts are online platforms such as eBay, Allegro and Aliexpress (A24A), and for the marketing of vehicles in whole, platforms such as Autoscout24 may be used (A17A). Illegal trade in cars and car parts on the Internet is difficult to stop because it hardly differs from legal trade (B08A). An effective barrier would be if manufacturers ensured that their parts had a longer life expectancy and that original spare parts were more affordable (A22A; C24B).

The harbour police and water police of the federal states as well as Frontex act as partners in the detection and prevention of shipments. ISF projects, tendered at European level, bring together investigators equipped with surveillance technology (transmitters, drones) to pool information
In general, international cooperation is effective, e.g. Joint Investigation Teams (JITs) between Germany and Poland or cooperation between the Bavarian criminal investigators (LKA) and authorities in Austria (A22A). This cooperation helps to ensure GPS and mobile phone tracking across borders (D02A). According to EU regulation 2015/758, every vehicle must be equipped with the so-called eCall since March 31, 2018. Manufacturers use existing systems such as WhereIsMyCar or SIM card on board (A17A; A22A; C24B) or develop their own vehicle tracking system (C24A).

Within the police, specialist knowledge exists in regards to offers of stolen vehicle parts on the Internet or to the recovery of stolen vehicles (Zöls 2015; A17A; A22A; A24A). From the point of view of investigators, more traffic and police controls as well as more automated number plate recognition and camera surveillance on streets and motorways, radio cell analyses and other forms of surveillance of telecommunications and a relaxation of data protection are needed in order to use them effectively (A17A; A22A; A24A; B08A; D02A).

As a barrier to the selling of stolen car parts, researchable serial numbers are more productive than artificial DNA (A17A).

### Main findings (for dissemination)

- Most permanently stolen cars in Germany are transported eastwards by land and to a lesser extent by ship to different parts of the world.
- Improving the tracking of vehicles and the more comprehensive identification of vehicle parts with serial numbers can make it more difficult to export stolen vehicles and to sell them.
- Intensive and routine interregional and international cooperation is required.

### STEP 7: PROFIT

A BMW X5 worth 60,000 Euros is sold to final customers for 12,000 to 15,000 Euros. After deducting the costs for fees and material costs, the organizer earns around 5,000 to 7,000 Euros per vehicle. The expenses for latest theft technology and software are amortized after the sale of five to six stolen vehicles (A17A). A set of relay-attack tools costs well over 10,000 euros on the black market (D02A). It is not known in systematic detail how profit is generated, how the car parts are sold and how profits are reinvested (A17A; B08A). It is known that the profit from the sale of car parts is significantly higher than the profit generated from the sale of the whole vehicle (D02A).

The mechanics dismantling the vehicles are the lowest paid. In the eastern part of Germany, the courier drives a vehicle across the border for 50 to 100 Euros (A24A), in the western part, the fee ranges up to 300 to 500 Euros (A17A; D02A). The thieves earn a little more, depending on their position in the group. The large financial flows do not take place in or to Germany (B08A).

Experts assume that transactions are mainly made in cash. Payments via crypto currency or online payment systems are conceivable, but, so far, no concrete evidence has been obtained (A24A; B08A; D02A). The same applies to the sale of stolen vehicles and vehicle parts via the Darknet and...
for Bitcoin (B08A). Financial agents who do business with false credit card data are also active as facilitators (A17A).

Payments via hawala banking, which Jordanian-Lebanese fences have used for payments to Germany, could signal the perpetrators’ whereabouts (A17A).

<table>
<thead>
<tr>
<th>Main findings (for dissemination)</th>
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<tbody>
<tr>
<td>- Due to the high demand for vehicles and vehicle parts, motor vehicle crime remains profitable.</td>
</tr>
<tr>
<td>- Illegal trade is difficult to distinguish from legal trade.</td>
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<tr>
<td>- Vehicles and vehicle parts could more extensively be marked and included in a networked system in such a way that they can no longer be used when stolen, thus reducing, if not eliminating their marketability.</td>
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</table>

DISCUSSION

There is disagreement about the expected trend in the theft of motor vehicles. Some of the experts surveyed assume that the prevalence of theft will stabilize at the current relatively low levels, since effective measures are being taken to prevent keyless technology from being manipulated (A17A; A24A; A22A). In contrast, other experts expect a significant increase in vehicle thefts given the continued existence of vulnerable keyless systems (C24B; D02A). Increased thefts of campers could mark a shift away from cars (C24B).

According to the Police Crime Statistics, the majority (57.1%) of the suspects involved in vehicle theft are German nationals (BKA 2022, 11). In the discussion about organized motor vehicle theft, on the other hand, the emphasis is on foreign actors. One explanation for the relatively large share of German suspects in the Police Statistics is that German suspects tend to be limited to Germany and are said to act less professionally than foreign criminal groups (A17A) and are therefore easier and more comprehensively identifiable. It is also conceivable that many suspects with German citizenship have family ties with cross-border MOCGs.

Calls for more extensive electronic surveillance of mobile phones may be futile to the extent perpetrators consistently switch off their phones once they enter Germany (B08A). There are also calls to increase persecution pressure and increase punishments (A22A; A24A). With respect to economically marginalized courier drivers, however, the risk of higher penalties might have only little deterrent effect.

In international comparison, data privacy is given greater weight in Germany, which has made it more difficult for law enforcement to track and locate stolen vehicles through automotive IT. However, two recent higher court decisions found that access to vehicle-related data in criminal investigations does not pose legal problems (OLG Stuttgart, May 19, 2021 - 2 Ws 75/21; OLG Frankfurt, July 20, 2021 - 3 Ws 369/21). As a result, tracking stolen motor vehicles may become a more common practice in Germany in the future.
Most important lessons learned (for dissemination)

- While some experts recognize a stable low level of theft, others anticipate a massive resurgence in the number of cases due to the continued vulnerability of keyless technology.
- Localization and tracking could become more common practice in Germany in the future.
- Perpetrators anticipate police action and change their behaviour (e.g., turning off phones).

**Conclusion**

Germany, from the 1990s to 2021, has seen a long-term decline in vehicle theft. In 2022, the numbers returned to pre-pandemic levels. Germany is primarily considered an export country for stolen vehicles. A small number of stolen cars from Western Europe are marketed in Germany or transported through Germany to Eastern Europe. Usually perpetrators operate in international MOCGs. All brands with a focus on German premium vehicles are affected. Common modi operandi include relay attacks on vehicles with keyless systems, Gameboy tools, and mechanical and OBD access. Process steps identified include: obtaining tools, identifying target vehicles, opening target vehicles and tampering with vehicle electronics, theft, modifying the cars for camouflage, parking the vehicle for short periods of time to 'cool down' or immediate transport across the border, transport to target countries as a whole or dismantling; and finally selling as a whole, possibly advertised via online platforms, and selling parts online or offline.

The most important partners in the private sector to prevent organized vehicle theft are manufacturers, insurers and automobile associations. An effective barrier model would focus on intersectional and international collaborations that educate stakeholders and partners on emerging vulnerabilities and crime schemes, as well as promising technological, administrative, and legal barriers to prevent organized vehicle crime.

Most important lessons learned (for dissemination)

- As long as the business model of car theft is profitable, it will be used by criminals.
- It is still easy to quickly and with little to no damage steal premium motor vehicles.
- The certification of anti-theft protection for new models by reputable institutes creates incentives for manufacturers to reduce their vehicles’ vulnerability to motor vehicle crime.
Introduction

Part 1: vehicle thefts in France, a transformation behind the decline. The withdrawal of opportunistic theft and resistance of organized crime related theft.

How to define vehicle theft and its components and modalities: the legal definition and beyond

Convicted in all European Union's countries, vehicle thefts and attempted thefts are considered as an offence to property. V-BAR project aims to limit their prevalence thanks to logistical barriers. It attempts to better understand the thefts aiming at formulating adapted recommendations to tackle them. These recommendations will be logistical barriers susceptible to be adapted to the different member states of the European Union. It especially aims to better apprehend the disguising and resell chains of these vehicles. Theft is defined in the penal code as « The fraudulent subtraction of the thing to others ». It would also be defined by the existence of a victim losing a right on his property.

Regarding the definition of vehicle theft itself, the definitions given in the official measurements made by the SSMSI (statistical service of the Ministry of the Interior) and the INSEE are based on a definition of vehicle theft which remains that of the "State 4001" which defines them as “the addition of the thefts (or attempted thefts) of cars, motorized two-wheelers, cargo vehicles, and trailers, offences that generally fall under the same operating procedures”. We can notice that the definition here is justified by the modus operandi. However, we have observed that this definition does not include certain illegal appropriations of vehicles, in particular the diversion of rental or leasing cars (lease with option to purchase) that may be classified as “embezzlement” or “breach of trust” and not as vehicle theft while they are examined by tribunals (The ARGOS estimates that there are 26500 of such embezzlements every year).

In addition to this legal dimension, theft has a material, economic, social, and psychological dimension. Economically, theft will involve the forced transfer of property from a victim to a culprit who can then enjoy the additional utility provided by it or enjoy its exchange value and also can use it or sell it. Its psychological dimension thus lies in a double potential effect: frustration for the victim, or even more if the theft was violent for example. Concerning the thief, the effects can range from the simple endowment effect to guilt. The material dimension is the use of a technique, sometimes applied by a tool in order to recover the property and appropriate it, likely to cause significant damages. Finally, the social dimension is the realization of a practice perceived as socially deviant, leading to a condemnation by social institutions, by the society as well as the state institutions. As for the vehicles concerned, they include all motorized vehicles used for travel and likely to be stolen automobile, two wheels, cargo vehicles, agricultural vehicles, ... which can be completely stolen or be partly stolen or disassembled.

Interstats, SSMSI. (2020). "Insecurity and delinquency in 2020: statistical review"
Several conditions and several reactions to the realization of a vehicle theft appear to be structurally related, simultaneously social, economic, and material. First, the realization of a crime such as the theft of the vehicle necessarily involves one or more culprits and one or more victims who know the loss of a property. Thus, it will be their definition, their perception of this act and their motivations that will determine whether or not this act will lead to an investigation and will make possible to identify it (except in cases of flagrante delicto) and to study it, take it into account and for the police to carry out a search for the culprits.

A theft includes therefore social condition for the occurrence of a vehicle theft. The victim’s reaction and the thefts attitude and conditions of action are determinants for the theft. The victim can for instance not lodge complaint leading the theft to be completely ignored by the authorities. The culprit can consider himself as “not an actual thief” in spite of the law, especially here in the case of joyriding where some thieves consider themselves to be “borrowers of the car”38. However, it would be unconvincing to consider here that we are dealing with a case that sociologically approaches a simple “labelling as deviant” as Howard Becker had been able to define it. In these cases, the deviant does not perceive himself in rupture with social norms or laws but is considered as deviant by the society. We are far from this kind of cases, first by the presence of clearly identified victims and because the victims define themselves as victims. We can take as an indication a very high rate of complaint filings among the victims of a successful theft, close to 92% between 2011 and 201839. Concerning the culprits, the qualitative literature notes their propensity to consider their practice as criminal and illegal, even if they develop discourses of justification. Mullins and Cherbonneau40 describe, for example, cases of women stealing car to men trying to flirt with them, criticizing their intentions as a justification of the vehicle theft. In these interviews they largely acknowledge theft while developing a discourse of legitimation, but while such discourses exist for most crimes. A recognition of flight that is probably not unrelated to the gradual decrease in amateur stealer while we notice a clear stability of the number of thefts by more specialized groups. A situation that is more adapted to the formation of a deviant subculture41 that is defined according to its deviance, even if it means to shape this culture against the norms of the rest of society.

Nonetheless, the social construction of these groups of vehicle theft professionals is not sufficient to explain all the variations in their activity, the targets they choose, the size of their groups, ... disregarding material necessities and conditions. For simple functional reasons, the activity of theft of a professional vehicle thief, which is usually a theft that aims to sell the stolen vehicle can be durably maintained only if certain income can be derived from it (as any kind of legal or illegal business). It is therefore conditional on the existence of outlets, which is not the case on the other hand for so-called usage theft (stealing a car to use it personally). Resale theft requires several elements for its sustainability: sufficient demand to reach prices allowing at least the survival of the group, the possibility of meeting this demand, a workforce capable of transforming vehicles to disguise theft vehicles or to export them in a way adapted to the frequency and intensity of controls if the vehicle is not exported. This mode of vehicle theft thus requires the existence of broad

41 CONWELL Chic & SUTHERLAND Edwin. (1937). The Professional Thief, By a professional thief, University of Chicago Press.
economic conditions at the level of society as a whole, combining the existence of supply and demand for stolen cars. Which may question the sensitivity of this demand to reinforced controls. But they also require a sufficient supply of illegal labour force, which sensitivity can be questioned this time to logistical obstacles and police controls. But we can also question the possibility to create barriers making it impossible to meet the demand for illegal labour of pre-existing networks and a ‘productive’ capital (here allowing theft) held by the group of professional thieves. The market prices of stolen vehicles, traditionally lower than those of conventional vehicle markets, might suggest a superiority of supply over demand, but this is to forget that the difference in rigidity in pricing between these two markets is extremely strong. On the one hand, the illegal market is subject to the rigidities of risk taking and necessities to escape legal controls, on the other hand, the legal market is subject to the rigidities inherent in the production of vehicles (regulations, prices of materials, company agreements, etc.). There will also remain a case to be explored in particular, which is the case of resales of spare parts, either following the disassembly of the vehicle or the theft of a component of the vehicle.

Finally, explaining and being explained in part by the preceding factors are therefore also material modalities of these thefts. Logistical barriers depend, first, on the level of capital that the group will need to steal the vehicle: between a vehicle whose key is left on the ignition and a vehicle with an alarm, the equipment needed for the theft differs significantly. Similarly, thieves will need differentiated learning and levels of training. While Mullins and Cherbonneau explain that extensive vehicle theft training lasts only a few months, it nevertheless requires the involvement of several members of the deviant group whose own level of training can largely affect the group’s flight possibilities. This question, however, requires further study of the groups. But logistical barriers involve not only thieves but also victims and authorities. Maurice Cusson also describes several possible levels of installation of these barriers described in the translated diagram below.
Cusson decides, however, here to present these elements as if they were presented at the same time as the action of the group of thieves. Julie Roy therefore proposes an alternative vision of the script (anticipation of the actions that will be produced by someone because of a cognitive construction) of these thefts, longitudinal and specific to professional thieves. The interest being that in the junction between each step seems to be able to be introduced a logistical barrier that we will discuss.

It is in front of such schemes that the possibility of new logistical barriers to combat vehicle theft can be questioned, designed in function of the thieves and the social conditions of the theft. The pre-existing literature can also provide us with some indications on this subject. 42

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42 Julie Roy, Le processus et la structure entourant l’export de véhicules volés, Université de Montréal, 2005
National quantification and international comparison of motor vehicle thefts

The measurement of a crime has often been carried out by three dominant approaches. The first relates to judicial statistics, which are used less and less to quantify offences since they cover only a very limited part of the committed crimes. The other two means are police statistics, based on complaint filings and the ultimate mean is to conduct a victimization survey. However, it appears that in the case of vehicle theft these two types of investigations give similar results, an idea reinforced by the estimate put forward by the living environment and security survey: 92% of the victims of vehicle theft fill a complaint. On the other hand, the estimate is 43% of complaints or a report to the police blotter following a failed attempt to steal a vehicle. According to the same survey, they would be in France 209,000 in 2018 among which 24% (about 47,000) of these thefts and trials would have succeeded. However, it is necessary to clarify that these data are estimators and not the actual values of vehicle thefts, however the rather large number of the survey (19,600 interviewed) and its method of hand-to-face passing until 2019 ensure both a certain statistical power and a lower risk of bias related to non-responses. But one of the most statistically significant results is the sharp decline observed in this number of vehicle thefts since the creation of the survey in 2006: from 570,000 the estimated facts went to 270,000 in 2012 and 209,000 in 2018. It can be observed that this remains within acceptable measurement differences compared to the 143,000 complaints of theft and attempted vehicle theft recorded by police and gendarmerie statistics. We can also note that the differences concern much more attempted vehicle thefts than vehicle thefts completed because of lower complaint filing rates (49% for unsuccessful theft attempts).

It is quite important to note the weight of vehicle theft in the measure of overall delinquency. In France they would represent nearby 10% of the total crimes recorded in 2018. A proportion that has decreased of a few percentage points since the years 2000 but continues to make vehicle theft one of the quantitatively dominant aspects of theft and even crimes in France.

There is also a certain dilemma in the measurement of vehicle theft: to apprehend them in relation to a population, one may wonder whether it is preferable to measure them in comparison to the total of vehicles on the territory or in comparison to the number of inhabitants. The measures of these two indicators vary quite proportionally at the national level but can vary quite widely by focusing on more local scales. We can think that as much as possible it is especially preferable to measure when the available data allow it.

This statement does not inform us about the current evolutions of vehicle theft at the macro level, nonetheless. It would be necessary to study this aspect to identify eventual recompositions of the vehicle theft market and dynamics. It is also important to make first international comparisons, and in a second time intertemporal comparisons.

But how can we then study the difference in vehicle theft rates between France and the other European Union’s member states? Indeed, if some other member states produce victimization survey with representative or randomized samples, it is not the case of every member state. Moreover, even with well-designed victimization survey we can hardly compare the precise questions asked to the surveyed citizens. This is the reason why, for this comparison, we have decided to first focus rather on the different data transferred from most European police services to Eurostat in 2020 that are represented in the following graph.
We can notice that French theft rate is higher than the European average theft. But here we are facing the police data, and this higher rate can show a higher rate of vehicle theft or a higher declaration rate to the authorities in case of vehicle theft. Therefore, it may seem relevant to check if we observe comparable results in a few victimization surveys. Once again, we will not try to compare the theft rates estimated from police data and from victimization surveys but rather check if the overrepresentation of vehicle thefts in France can be observed in some victimization surveys as well.

Figure 15: Motor vehicle theft rates for 100000 inhabitants in European Union’s member states
But if we observe the ICVS (International crime and victimization survey) led in Europe and beyond we can notice results that are significantly different in terms of the vehicle theft rates across European member states. So, we have in the current situation no evidence showing that vehicle theft rate in France is significantly higher than the European average. However, it seems to appear that France is characterized by a higher complaint rate among the victims of vehicle thefts. This is a first conclusion with high consequences in terms of policies: there is no special need to lead high-cost policies trying to get higher declaration rates to the authorities in case of vehicle theft. France seems indeed to have a declaration rate significantly higher than the average. We can now observe the proportion of vehicle theft among the total of reported crimes in 2020 in France and in Europe.

We can notice here again that France is among the countries with the highest proportions of vehicle theft among the total sum of crimes recorded. The relative position of France is quite similar in both case, which could mean that vehicle theft is a widespread delict in France or mean that it is especially well registered in France compared to other countries. Our previous results tended to indicate that France knows no special overrepresentation of car thefts. So, we could guess here, that vehicle thefts are not only a well-recorded offences in France but are better registered than most other offences as well. This is clearly a meaningful result that indicates the weak usefulness of a policy which would tend to get better declarations rates for this delict. Awareness-raising of the potential victims or an increase in recording means for the police could tend to rise up this declaration rate, but we can remember here that in the specific case of France if would risk having
little benefits as being given the tiny part of the population who doesn’t declare the vehicle thefts it suffers.

Figure 17: Representation of the proportion of vehicle thefts among other reported crimes

But beyond this comparison, data at the scale of countries does not seem to be a truly relevant scale to study the determinants of a criminal offense, as the variables that may differ from a country to another and modify the prevalence of a criminal offense are extremely numerous and spontaneously expose us to substantial risk of being trapped by confounding variables.

However, we can check if vehicle theft rates are well correlated with other crime rate at countries’ scale. The best to lead such an exploratory analysis seems to use a PCA (principal component analysis), which can bring exploratory results by representing the similarities of national rates between diverse type of crimes. These results are strictly exploratory and do not aim to draw conclusions anyway, only to have ideas of potential further analysis at the individual scale. We print the results of our PCA.
Ten supplementary variables with the highest correlations with axis 1

<table>
<thead>
<tr>
<th>Variable</th>
<th>Coord</th>
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<td>Theft.2019</td>
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<td>0.462</td>
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<td>Sexual_assault.2019</td>
<td>0.426</td>
<td>0.182</td>
<td>0.426</td>
</tr>
<tr>
<td>Rape.2020</td>
<td>0.424</td>
<td>0.179</td>
<td>0.424</td>
</tr>
<tr>
<td>Rape.2019</td>
<td>0.416</td>
<td>0.173</td>
<td>0.416</td>
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<td>Sexual_assault.2020</td>
<td>0.416</td>
<td>0.173</td>
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<tr>
<td>Robbery.2020</td>
<td>0.407</td>
<td>0.166</td>
<td>0.407</td>
</tr>
<tr>
<td>Robbery.2018</td>
<td>0.386</td>
<td>0.149</td>
<td>0.386</td>
</tr>
<tr>
<td>Robbery.2019</td>
<td>0.384</td>
<td>0.147</td>
<td>0.384</td>
</tr>
</tbody>
</table>

We get two axes among which the first has a higher inertia than the second one. It opposes the countries with the highest theft rates with the other ones. It is not surprising as our active variables are the vehicle theft rates. The interesting part is that there is not any of our supplementary variables (all other types of criminal offences recorded by Eurostat) that is really near the vehicle theft vector.
on the factorial plan. It seems also, that at the international scale, car theft rate is not especially correlated with any other criminal offence. But we will deepen this analysis at the individual level. We can nonetheless notice that in terms of contributions, some variables have significantly higher $\text{cos}^2$ and correlation with axis 1. Theft, sexual assault, and rape seem to be the main of them. We will not interpret this correlation further for the moment because we still lack information, but it could be meaningful about the structure of international criminal network or most probably be due to confounding variables.

Figure 20: Axis 1 and 2: The countries with the highest theft rates

But we must notice beyond this category of “vehicle theft” that several interviewees have underlined the rise of several criminal offences that aren’t currently considered as “vehicle theft” due to the modus operandi but nonetheless have similar consequences for the victims and the thefts. Keeping a rental or leasing vehicle for oneself without paying is for instance an emerging behavior according to our interviewees. The main benefit for the thief is to be sure not to be
considered as vehicle thief in case of apprehension or trial in France. The delict will be qualified as embezzlement, breach of trust or even "commercial litigation."

We cannot reproduce here the different charges presented before because offences that have no relationship with vehicle theft are described by the same charges (bank card frauds, ...) and they do not describe such modalities of vehicle theft in some European countries. In contrast, quantifying this theft is really at stake during the study of the case of vehicle theft in France. It may indeed justify a redefinition of the notion of "vehicle theft" or lead us to adapt the logistic barriers to these illegal vehicle obtention modality. Two approaches seemed to have the potential to enable us to quantify these offences: a better collaboration with private structures that are the main victims of these modalities (rental societies, leasing societies, ...) or the obtention of very detailed data about these offences.

The main current trends in France: the decline in amateur theft and the persistence of professional theft.

The decline in the number of vehicle thefts does not seem to be strictly localized in France as we found evidence of a similar phenomenon in several countries’ literature (Canada, United States, Australia, United Kingdom, ...). But it is accompanied with another phenomenon: the decline in the rate of recovered theft vehicles. According to the CVS survey it fell from 64 to 54 % between 2015 and 2018. We can observe this phenomenon in Canada as well and in the long run with a decline from 84 to 72% from 1963 to 1988.

This result was interpreted in the literature as the sign of a professionalization of the authors of vehicle thefts, a necessary professionalization in order to resell the vehicles rather than using it immediately. There are nonetheless several risks with these thefts: a lower probability for the victims to recover the vehicle, the possibility for the thefts to export it to other criminal organizations or to sell it while it is dangerous for its driver. Moreover, the incomes of the resell of this vehicle could finance other criminal activities. Through these conclusions, we can make a first typology of the different types of vehicle thefts:

<table>
<thead>
<tr>
<th>State of the vehicle during the resold</th>
<th>Vehicle sold intact</th>
<th>Vehicle sold once it is in spare parts</th>
</tr>
</thead>
<tbody>
<tr>
<td>Export abroad</td>
<td>Theft answering an international demand for a model of a vehicle.</td>
<td>Dissemination of spare parts and raw materials on one or several foreign markets.</td>
</tr>
<tr>
<td>Fencing on the national territory</td>
<td>Fencing and disguising of the vehicle on the national territory</td>
<td>Fencing of spare parts and raw materials from the vehicle.</td>
</tr>
</tbody>
</table>

Figure 21: Typology of the different types of vehicle thefts

---


44 Ibid.
Edwin Sutherland had already underlined\textsuperscript{45} that the professional thief was rather gifted in hiding his offence than in realizing it. The highest risk for him is indeed rather to be detected than to fail one particular theft. In the case of vehicle thefts, we can notice that this ability to dissimulate the theft depends mostly on the ability to disguise the vehicle and produce fake documents for it. This type of activity requires the adhesion of the thief to a group in which there is a strict division of labour. Nonetheless, these are the relative importance of each task in this which vary in function of the export or not of the vehicle. Julie Roy\textsuperscript{46} notices from examples of different police operations in Quebec export of vehicles by criminal networks rather concentrate on the false documents and the contact with international stakeholders while those who sell on local market focus more on the moment of the theft. This ability to disguise the theft vehicles seems indeed to be a major condition for bypassing the possible controls before the theft of the vehicle, among which there are very simple controls like the control of the VIN (vehicle identification number).

We can also wonder what the reason of this evolution was, which actually correspond to a decrease in the number of usage thefts combined with a stability of resale theft. The main explanation is the low equipment and formation of the thieves who use the vehicles, while they are rarely equipped with electronic unlocking systems\textsuperscript{47}. It also seems that these thefts are now blocked by the progresses of the logistical barriers that already exist. We can get better convinced of this phenomenon while observing the theft rates of different car models before and after high security systems were put in place on them, especially the automatic lock of cars’ doors\textsuperscript{48}. This is not a causal or experimental approach, it is actually rather observational as the owners of new and ancient car models are different, but it can anyway give us evidence of the impact of the security systems on car thefts.

To that extent, the profile of vehicle thieves seems to have changed through the development of a criminal carrier for the thieves. It changes their position in the socioeconomic life. But we noticed

\begin{figure}[h]
\centering
\includegraphics[width=\textwidth]{figure22.png}
\caption{Effect of improved security on high-risk popular Vehicle Models\textsuperscript{1}}
\end{figure}

\textsuperscript{46} ROY Julie. (2005). The process and structure around the export of theft cars. Université de Montréal.
that such vehicle thefts are also dependent on the demand on the international market and also target specific vehicles.

Specification of the most involved vehicles: sport utility vehicles (SUV) and city cars as main victims and the lack of statistics about the vehicle parts.

A multipartite market exploiting the international export opportunities or the legal opportunities enabling to disguise a car on the national soil.

During the study of the literature, two main approaches of the comprehension of the methods to fight against vehicle theft seemed to be identifiable. The first one\textsuperscript{49} insists mainly on the theft methods and the logistic barriers able to block the thieves during his action. The second one rather insists on the methods to struggle against\textsuperscript{50} the demand for vehicles to dissuade the thefts while diminishing their possible benefits.

Most economic and econometric models observed in the literature suppose that demand influences the supply, at least in a certain measure. Which seems quite relevant since the theories considering that the supply creates its own demand have been mainly refuted including the Say’s law which has been empirically and theoretically refuted by Keynes. Nonetheless, we must suppose that the thefts and their associates must get at least a sufficient reward to ensure their survival as they are professional thieves. Charles Delagrave\textsuperscript{51} identifies a significant correlation between the prices on vehicles’ market, wages at the national level and the offer for stolen cars (also the number of resale thefts). This is nonetheless not a causality, and it is only possible that the setting up of logistical barriers against the demand for vehicle thefts would be able to lower the number of vehicle thefts.

While studying the market for theft vehicles, we only question the resale theft, as the usage theft does not aim to produce an income. It seems that it is also necessary to think separately about the export thefts and thefts on the national territory and between the resale of the integral vehicle and the resale of vehicle parts. First, the controls while exporting a vehicle are not similar to the necessary disguising to sell a vehicle on the national territory. Export thefts do not imply the same efforts to disguise the vehicle or to produce fake vehicle documents. We could also think about a better collaboration with the customs in order to better identified the theft vehicles for instance. Concerning the difference between the resale of vehicle parts and of the integral vehicle, we can notice the apparent omissions of many controls of the scrapers and shredders.

A task force was noticeably put in place in Victoria in Australia\textsuperscript{52} which identified grave control omissions by 70% of the controlled scrap dealers. The instauration of such controls on the individuals susceptible to buy different metals could also lead to a decrease of the demand on the illegal market. It revealed severe dysfunctions in the controls against thefts put in place by the scrap dealers in Australia and the scale that this market could represent for vehicle thieves. We could object that in France, the legislation was hardened to struggle against this phenomenon. But it does


\textsuperscript{51}Ibid.

not take in account the non-declared scrap dealers, who were 46% of the interrogated scrap dealers in the survey of Victoria. Among the other results of the report, 20% of the scrap dealers sold dangerous scrap parts and 92% did not verify if the vehicles were stolen or not. We didn’t find any evidence of the existence or not of such a task force in France or in other EU member states, but these results can let us imagine that such a task force could have very encouraging results. Moreover, it could bring more safety for the drivers and for the environment as scrap dealers, if they do not apply some safety processes, are susceptible to threaten the drivers and environment as well.

During several interviews with stakeholders from police services as well as security staff members of some companies, we have noticed the frequent insistence about the legal problems with the distribution of garages’ agreements. Like other interviewees, our interlocutors from the OCLCO (central office of struggle against organized crime) noticed the hardships to control these garage owners and their relationships with organized crime. It was a real problem for car manufacturers to have to deliver the functioning of their security systems to such numerous garage owners on the territory, since more and more garage owners are established on the national territory. The right for any garage to register a vehicle under its name is something recent in France by made the control of the legality of registered vehicle much more difficult to verify. Some interviewees noticed as well, that even when the prefecture decided to withdraw the official license of a garage, the CCI (trade and industry chambers) often try to oppose to this decision.

We can also notice that the possibility to resale stolen vehicles with the support of garage owners and scrap dealers is a major opportunity for the thieves. They can get an access to the legal vehicle market, which enables them to bypass the hardships necessary to get access to the criminal market. It can also be an opportunity to put logistical barriers in place, that aim to struggle against this criminal opportunity.

Finally, we can ask ourselves how to produce a coherent theory and proposals combining the implementation of barriers with objectives of physically blocking thieves during their task and the implementation of means to decrease the demand on the market for stolen vehicles. This is precisely the idea originally developed by the V-BAR project by producing an action at all moments of the script that leads from the injection of funds to steal the vehicle to its final resale. Indeed, the action on the demand for these vehicles is a step in the implementation of logistical barriers that can be installed at each intersection of this script, which can be accompanied by the one produced by Julie Roy and reproduced here which details the more diverse modalities of these steps:

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**Figure 23**: Le processus et la structure entourant l’export de véhicules volés

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Criminals with identifiable profiles in hardly interpretable statistics

We have here studied the identifiable recurrent characteristics of the criminals involved in vehicle theft related major offences. In order to study these criminals, we have used the database of the ONDRP (national office of delinquency and penal response) about the individuals accused of vehicle theft. Nonetheless, we must remain very careful in our conclusions as these statistics suffer heavy biases. We have though no usable databases that enables us to avoid this problem.

The databases about accused people do not enable us to study a representative sample of the authors of vehicle theft. Indeed, the clearance rate for vehicle theft offences is only 6% after 1 year according to the ministry of the Interior. Nothing allows us to believe that there is no variable that could lead to higher clearance rates for individuals with given characteristics. Moreover, we do not take in account in this database the French individuals or groups arrested abroad while exporting vehicles that were theft in France. These are the two main reasons among others implying that we have no representative sample concerning the vehicle thieves. Also, we must consider that our conclusions are rather conclusions about the cleared vehicle thefts than about vehicle thefts in general.

For every analysis, we will study the differences distribution of the characteristics among the population of vehicle thieves and among the global population of accused people. Comparing our population with the French global population could only be a control and would not give us information about the actual profile of vehicle thieves. On the other hand, comparing vehicle thieves with other individuals accused of different crimes and major offences will enable us to differentiate processes of entrance into vehicle theft or abilities and weaknesses learnt for or due to vehicle theft from characteristics reflecting a higher probability of deviance for an individual.

First, we could draw the attention of some services involved in the fight against vehicle thefts. There are significant differences in the roles and investigation methods of police and gendarmerie in France. Policemen mostly monitors the urban areas, where most vehicle theft are operated (according to victimization surveys) while the gendarmerie rather monitors the rural areas, a necessary passage for vehicle thieves who can’t drive only in urban areas. Excepted maybe those who disassemble the vehicle and sell the parts of it. We know that gendarmerie records less complaints for vehicle thefts than police but in any case, we could see if there are significant differences in the clearance rates between these two institutions.

Two main conclusions seem to appear while reading these results. First, we must notice that police and gendarmerie classify the vehicles thefts with two different nomenclatures. For every category of the police’s nomenclature, there are two categories in the gendarmerie’s nomenclature. Indeed, the gendarmerie distinguishes while labelling a vehicle theft between simple and aggravated vehicle theft. This is very useful for us, because we know that there are several possible criteria that make a theft considered as “aggravated”\(^{53}\) and one of them is the realization of this theft in organized group or with the assistance of associates. It’s the main motive that leads to consider a theft as aggravated. We must nonetheless remain careful while interpreting this difference between aggravated and simple thefts because the sample of people arrested by the gendarmerie is still less representative than the global sample constituted by the accused individuals. Moreover, it is still possible that only one member of a criminal network has been accused while the others are still not accused. For these reasons we cannot consider that the number of accused is neither

\(^{53}\) Article 311 section 1 du code pénal
The second conclusion is the light overrepresentation of gendarmerie in the number of accused individuals. Which could tend to indicate that there is a light overrepresentation of individuals identified while being under the jurisdiction of the gendarmerie. But this could be explained by many factors, among which the rural aspect of the areas watched by the gendarmerie, but we can lead further analysis to determine it.

---

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<tr>
<th>Variable</th>
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<th>Contrib</th>
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<td>0.979</td>
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<td>0.341</td>
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<td>Infraction's label</td>
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<td>Infraction's label</td>
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<td>0.93</td>
<td>0.019</td>
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**Figure 24:** Modalities with the highest contribution to axis 1 of the MCA (most numerous individuals and high difference with theoretical number of individuals predicted in chi square test)

<table>
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<tr>
<th>Variable</th>
<th>Level</th>
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<th>Contribution</th>
<th>Cos2</th>
<th>Count</th>
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</thead>
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<td>Distance</td>
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<td>22.50</td>
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<tr>
<td>Service</td>
<td>Police</td>
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<td>14.231</td>
<td>6.50</td>
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<tr>
<td>Duration</td>
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<td>1.850</td>
<td>5.79</td>
<td>0.073</td>
<td>158</td>
</tr>
<tr>
<td>Duration</td>
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<td>2.745</td>
<td>5.16</td>
<td>0.064</td>
<td>64</td>
</tr>
<tr>
<td>Infraction's</td>
<td>Aggravated</td>
<td>-1.261</td>
<td>5.05</td>
<td>0.065</td>
<td>297</td>
</tr>
<tr>
<td>Infraction's</td>
<td>False</td>
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<td>4.62</td>
<td>0.057</td>
<td>9</td>
</tr>
<tr>
<td>Distance</td>
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<td>4.50</td>
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<tr>
<td>Duration</td>
<td>0</td>
<td>-0.294</td>
<td>4.39</td>
<td>0.143</td>
<td>4734</td>
</tr>
</tbody>
</table>

**Figure 25:** Modalities with the highest contribution to axis 2 of the MCA (most numerous individuals and high difference with theoretical number of individuals predicted in chi square test)
Figure 26: Multiple component analysis examining the distribution of the effectiveness of vehicle thieves in function of the theft characteristics and the profession of the thieves.

Figure 27: Multiple component analysis examining the distribution of the effectiveness of vehicle thieves in function of the theft characteristics and the sociodemographic characteristics of individuals accused of theft.
To deepen our first results with an exploratory analysis we drew an MCA (multiple component analysis) that enables us to study the similarity and differences between modalities of several variables. To make our MCA easier to read we made a first graph where only the professions are used as supplementary variables and a second one where all other supplementary variables are represented. In these MCA, we added a representation of the numbers of population of every modality to observe the distribution of the population at the same time. The main point here is to interpret the meaning of the axis. While studying the graphic MCA and the factors used to build the factorial plans, we can give a pragmatic meaning to these axes. The first one seems to represent an opposition between the offences recorded by the police and the gendarmerie. We can notice that the other differences observed mostly depend on this difference: obviously aggravated vehicle theft (not recorded by the police) aren’t represented nearby the police but nearby the gendarmerie. The second axis is harder to interpret as very different modalities contributed massively to its building. But two highly represented variables seem to be the duration before clearance and the distance between theft place and theft where individual was arrested. It opposes as well, though in a less pronounced way, the two wheels vehicle thefts and automobile thefts (the effectives for cargo vehicles are low).

We can draw here several conclusions already observed in the literature. We notice here again an overrepresentation of men among vehicle thieves for any king of major offence represented. Here again we find that French citizens are from far more numerous than any other nationality. The only specificity about nationality is an overrepresentation of non-French citizens in the police’s arrests but this phenomenon is easily explainable by their underrepresentation in rural areas where gendarmerie is the most present (4.5 million in 5 million immigrants present in France would live in major urban areas according to the INSEE (national institute of statistics and economic studies). The most interesting and non-obvious supplementary variables rather seem to be the distribution of the individuals by age and profession. We can indeed notice that since 2010 vehicle theft (34.7% of offences committed by minors) has become with violent thefts (46%) and simple thefts (34.6%) the offence for which minors are the most represented among the accused. We can here study the distribution of these minors between the different offences. The individuals who are less than 25 are indeed lower following the axis two than the older accused individuals. We can especially notice that they are nearer the modality related to two wheels vehicle theft. Through this difference in population numbers, we could approach a widely diffused representation from popular culture that draws important relationships between teenagers and two wheels vehicles, regularly confirmed by statistical studies about the equipment of these teenagers (19.2% of couples with children have two-wheels vehicle against 8.7% of childless couples according to the tabs of French economy (INSEE)).

It seems that we are facing here a socially constructed desire of teenagers for two-wheels vehicle, built by representations as well as material constraints (license easier to get, less expensive in oil, ...). This desire making two wheels vehicle more desirable. We can as well notice that there is an overrepresentation of these two-wheels thefts in the urban area of Paris, but concerning the geographical localization of thefts, victimization surveys are more instructive than statistics about complaints.

We can moreover get interested in the gender of the vehicle thieves. It was widely explored by the qualitative study of Mullins and Cherbonneau54 about vehicle theft by women in St Louis. They noted that the environment of professional vehicle theft is very hardly accessible to women. They

notice that the criminal networks are controlled by “gatekeepers” borrowing this concept to Lazarsfeld who used it to describe the attitude of some stakeholders who make themselves guarantors of the respect of the norms inside the group. These gatekeepers are extremely distrustful toward women as they consider them as “weakly reliable”. Women must also prove their abilities without having been educated by the group and also take much higher risks which contributes to deepen the reputation of week reliability of women in vehicle thefts. It seems also that these networks are quite “conservative” concerning their gendered structure which creates a loop that takes women away from vehicle thefts. A clearly visible result in our MCA as we notice the much weaker representation of women in our effectives.

Another main conclusion driven by the analysis of the age of accused individuals is that there are more young individuals accused for whom the clearance time and distance from theft place was shorter. This underlines especially the importance to consider this database as instructive about accused individuals and not representative of all criminals. Indeed, beyond 25 years old, the clearance times seem to be near the modality of 1 year on the axis 2 (partly built with clearance duration), while it’s nearer 0 year for accused individuals between 10 and 25 years old (excepted individuals between 69 and 80 but they are very few). Also, it seems that the clearance of theft cases is even harder when the criminals are more aged. We can here draw a link with Maryse Hesterle-Hedibel’s 55 qualitative results: the older individuals of the band, already parts of organized and professional vehicle theft networks are much more discrete than the younger thieves practicing joyriding. For this reason, it could be interesting to lead further investigations about these older individuals who are more likely to be more experimented and gifted thieves and a potential essential individual for a criminal network.

A result about the high visibility of young thieves that has been qualitatively noticed as well. Indeed, whether usage theft is often described as a social practice because it implies a set of common justification and peer-to-peer practice, describing the network seems irrelevant. Actually, it doesn’t appear activity provides theft usage networks identification, because if it can be practiced by several people, it is usually done between people who doesn’t see their social links formed by joyriding. It is much more often about friendships or seduction, which does not mean no risk of reoffending on the other hand but marginalizes network contacts creation provided by theft usage. Those are generally justified by their social construct of reality in the sense given by Berger et Luckmann, so influenced by media and influenced by a language and a self-vision, peers, and society. In their case, it is divided between the group, transforming theft usage into a social act and rest of society (the « out-group ») according to Maryse Esterle-Hedibel. They would depict their justification of car theft by the consequences denial of their actions toward out-group anyway considered as hostile for the most severe cases (long term grant and damage to the vehicle) and deny any nuisance towards the victim whose vehicle has been borrowed the least time. However, she also notes a very important change of habitus (but not ethos) in those who reconver in receiving: switching to non-provocative outfit, sober and discrete driving with stolen vehicles instead of excessive speed. She notes that those who show the best predispositions at usage theft but also the capacity this new frontage habitus is the one who stays long-term in the networks of receiving.

Finally, if we study the distribution of the professions in these factorial plans, we can notice that individuals who have no profession are overrepresented in our analysis. But we will not draw any conclusion about this overrepresentation before we checked that this overrepresentation is not similar for all offences presented in this database. A more interpretable and surprising result is the light overrepresentation of students among the individuals accused by the gendarmerie with 165 students accused while 110 were arrested by the police. It is especially surprising as students are usually much more numerous in urban areas watched by the police. But our limited numbers do not allow us to lead much further analysis about this difference in population that could give us additional information about a mean to better investigate some specific types of vehicle thefts.

We could interest us to another characteristic of the thefts as well: the aggravated or not character of the theft in function of the characteristics of the accused individual. It is a mean to check if the theft has been committed by an organized gang, but it is clearly insufficient to draw conclusion. That's why some authors like Maurice Cusson have proposed to use the rate of recovered vehicles as an instrumental variable to measure the professional or not professional aspect of the theft. It is possible to do it through the data of CVS survey (life context and security), but we will do it while interesting us to the profile of the victims. First, we will study the differences between individuals accused of aggravated thefts and those accused of simple theft.

<table>
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<th>P-value&lt;sup&gt;3&lt;/sup&gt;</th>
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<td></td>
<td></td>
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</tr>
<tr>
<td>Less than 18</td>
<td>475 (44%)</td>
<td>577 (28%)</td>
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</tr>
<tr>
<td>18 to 25</td>
<td>429 (40%)</td>
<td>701 (34%)</td>
<td></td>
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<tr>
<td>25 to 35</td>
<td>41 (3.8%)</td>
<td>172 (8.4%)</td>
<td></td>
</tr>
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<td>36 to 50</td>
<td>50 (4.6%)</td>
<td>289 (14%)</td>
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</tr>
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<td>51 or more</td>
<td>12 (1.1%)</td>
<td>103 (5.0%)</td>
<td></td>
</tr>
<tr>
<td>SEX</td>
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<td></td>
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<tr>
<td>WOMEN</td>
<td>37 (3.4%)</td>
<td>166 (8.1%)</td>
<td></td>
</tr>
<tr>
<td>MEN</td>
<td>1,042 (97%)</td>
<td>1,893 (92%)</td>
<td></td>
</tr>
<tr>
<td>Distance inter</td>
<td></td>
<td></td>
<td>0.009</td>
</tr>
<tr>
<td>[0,50)</td>
<td>922 (88%)</td>
<td>1,671 (85%)</td>
<td></td>
</tr>
<tr>
<td>[50,150)</td>
<td>91 (8.7%)</td>
<td>181 (9.2%)</td>
<td></td>
</tr>
<tr>
<td>[150,300)</td>
<td>20 (1.9%)</td>
<td>52 (2.6%)</td>
<td></td>
</tr>
<tr>
<td>Unknown</td>
<td>31</td>
<td>88</td>
<td></td>
</tr>
<tr>
<td>Duration before clearance</td>
<td></td>
<td></td>
<td>0.8</td>
</tr>
<tr>
<td>(years)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0</td>
<td>673 (62%)</td>
<td>1,259 (61%)</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>318 (29%)</td>
<td>628 (31%)</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>71 (6.6%)</td>
<td>122 (5.9%)</td>
<td></td>
</tr>
<tr>
<td>Profession's label</td>
<td></td>
<td></td>
<td>Not relevant</td>
</tr>
<tr>
<td>Apprentice</td>
<td>66 (6.1%)</td>
<td>115 (5.6%)</td>
<td></td>
</tr>
<tr>
<td>Craftsman, merchants and</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>entrepreneurs</td>
<td>24 (2.2%)</td>
<td>105 (5.1%)</td>
<td></td>
</tr>
<tr>
<td>Employee</td>
<td>19 (1.8%)</td>
<td>60 (2.9%)</td>
<td></td>
</tr>
<tr>
<td>Farmer</td>
<td>3 (0.3%)</td>
<td>35 (1.7%)</td>
<td></td>
</tr>
</tbody>
</table>
While seeing this tab, two main differences to expected numbers seem to appear. Young people are significantly overrepresented among the individuals accused of aggravated theft. This may also indicate a higher proportion of organized gang thieves but not necessarily. Aggravated theft can describe a theft using weapons or with aggravating circumstances as well. Moreover, our sample is far from being representative. But we can notice that minors are globally overrepresented in all kinds of violent thefts (46% percent of minors according to the ONDRP databases about minors’ criminality). The direct consequence is the overrepresentation of schoolboys among aggravated thefts. This could seem to be a surprising result as teenagers are rarely represented as especially violent and still less as members of organized crime groups, but several reasons can explain this result: a simple sampling bias due to the higher number of mistakes of this population during the theft, a global trend to more violent thefts. Similarly, women are still less represented among aggravated thefts, here again maybe due to a sampling bias but maybe due to elements of the feminine socialization to lower violence as well. But we can temper these doubts about an overrepresentation due to a sampling bias while we notice that the duration before clearance is not significantly different between aggravated and simple vehicle thefts. Which seems to mean that aggravated vehicle theft cases are not significantly harder to solve. This could lead us to an objective of intensification of the struggle against aggravated vehicle theft, which seems to bring much higher results (possibility to discover groups having stolen tenth of vehicles/violent individuals, ...) with investigation costs that do not seem especially higher. In these cases, individuals accused of vehicle thefts are by the way similar with many other populations accused of specific thefts.
Victims of vehicle theft: an overrepresentation of low equipped (no garage, collective lodgements, ...) urban individuals.

Here again, we are facing the same alternative that we faced during the international comparison. We must find a way to measure victimization and the victim's characteristics. Police and gendarmerie statistics or victimization surveys are the two ways of measuring it. We already know that vehicle theft seems to be a major offence for which the rate of victims who get recorded by the police or gendarmerie is among the highest. This makes the dilemma easier to decide as we can here consider that both have different main inconvenience: not measuring the moral persons (companies) victims of thefts for the victimization survey and not measuring individuals who do not file complaints for police and gendarmerie's data.

So, we decided to rather take profit of both types of statistical surveys while not comparing them. These surveys are led on two types of samples affected by different biases, so we do not compare them. As a revenge, the statistics about complaints and the CVS survey (security and life context). We will lead the simplest sociodemographic analysis on the police and gendarmerie data, which main asset is a certain community in the definitions of the different infractions and a wider precision in the infraction’s nature description. In contrast, these data are not very deepened regarding the characteristics of the victims and the conditions and situation of the theft. Also, we decided to study the CVS survey results about other modalities of the victimization. We will clearly separate both analysis and conclusions but try to have a more complete portrait of the victims of vehicle thefts through the more precise information we can get from the CVS survey.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Level</th>
<th>Coord</th>
<th>Contrib</th>
<th>Cos2</th>
<th>Count</th>
</tr>
</thead>
<tbody>
<tr>
<td>Municipality_size</td>
<td>Rural town</td>
<td>1.698</td>
<td>15.39</td>
<td>0.331</td>
<td>13580</td>
</tr>
<tr>
<td>Infractions_label</td>
<td>SIMPLE VEHICLE THEFT</td>
<td>1.177</td>
<td>12.26</td>
<td>0.286</td>
<td>22532</td>
</tr>
<tr>
<td>Municipality_size</td>
<td>PARIS</td>
<td>-0.874</td>
<td>8.94</td>
<td>0.223</td>
<td>29771</td>
</tr>
<tr>
<td>Infractions_label</td>
<td>VEHICLE THEFT</td>
<td>-0.610</td>
<td>7.52</td>
<td>0.239</td>
<td>51471</td>
</tr>
<tr>
<td>TYPE_PLACE</td>
<td>Individual or collective residence</td>
<td>0.947</td>
<td>5.81</td>
<td>0.128</td>
<td>16474</td>
</tr>
<tr>
<td>Infractions_label</td>
<td>TWO WHEELS VEHICLE THEFT</td>
<td>-0.690</td>
<td>5.62</td>
<td>0.141</td>
<td>30040</td>
</tr>
<tr>
<td>Infractions_label</td>
<td>AGGRAVATED VEHICLE THEFT</td>
<td>1.368</td>
<td>5.19</td>
<td>0.106</td>
<td>7058</td>
</tr>
<tr>
<td>Municipality_size</td>
<td>5,000 to 10,000 inhabitants</td>
<td>1.402</td>
<td>4.19</td>
<td>0.084</td>
<td>5426</td>
</tr>
<tr>
<td>Municipality_size</td>
<td>2,000 to 5,000 inhabitants</td>
<td>1.416</td>
<td>4.06</td>
<td>0.082</td>
<td>5158</td>
</tr>
<tr>
<td>NATIONALITY</td>
<td>OTHER</td>
<td>-1.123</td>
<td>3.24</td>
<td>0.066</td>
<td>6539</td>
</tr>
</tbody>
</table>
Figure 29: Characteristics on the factorial plan of the 10 modalities with the highest contributions to axis 1 of the MCA describing victims of vehicle theft recorded by police and gendarmerie.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Level</th>
<th>Coord</th>
<th>Contrib</th>
<th>Cos²</th>
<th>Count</th>
</tr>
</thead>
<tbody>
<tr>
<td>Infractions_label</td>
<td>THEFT NON-IMMATRICULATED VEHICLE</td>
<td>2.587</td>
<td>19.72</td>
<td>0.276</td>
<td>5226</td>
</tr>
<tr>
<td>Municipality_size</td>
<td>200,000 to 2M inhabitants</td>
<td>0.594</td>
<td>9.16</td>
<td>0.190</td>
<td>46019</td>
</tr>
<tr>
<td>AGE_intervals</td>
<td>[0,18)</td>
<td>2.551</td>
<td>9.12</td>
<td>0.125</td>
<td>2485</td>
</tr>
<tr>
<td>AGE_intervals</td>
<td>[18,20)</td>
<td>1.833</td>
<td>7.85</td>
<td>0.109</td>
<td>4147</td>
</tr>
<tr>
<td>Municipality_size</td>
<td>PARIS</td>
<td>-0.629</td>
<td>6.64</td>
<td>0.116</td>
<td>29771</td>
</tr>
<tr>
<td>Infractions_label</td>
<td>SIMPLE TWO WHEEL VEHICLE THEFT</td>
<td>1.318</td>
<td>6.18</td>
<td>0.087</td>
<td>6313</td>
</tr>
<tr>
<td>Infractions_label</td>
<td>VEHICLE THEFT</td>
<td>-0.398</td>
<td>4.58</td>
<td>0.101</td>
<td>51471</td>
</tr>
<tr>
<td>TYPE_PLACE</td>
<td>Individual or collective residence</td>
<td>0.647</td>
<td>3.89</td>
<td>0.060</td>
<td>16474</td>
</tr>
<tr>
<td>Infractions_label</td>
<td>SIMPLE VEHICLE THEFT</td>
<td>-0.540</td>
<td>3.70</td>
<td>0.060</td>
<td>22532</td>
</tr>
<tr>
<td>TYPE_PLACE</td>
<td>Public service</td>
<td>3.681</td>
<td>3.70</td>
<td>0.050</td>
<td>484</td>
</tr>
</tbody>
</table>

Figure 30: Characteristics on the factorial plan of the 10 modalities with the highest contributions to axis 2 of the MCA describing victims of vehicle theft recorded by police and gendarmerie.
If we observe this factorial plan, we can notice that the two represented axes seem to be to some extent coherent with the previous analysis led on accused individuals but with nonetheless some differences in interpretation as well as in results. Here again, we can find a first axis which opposes the biggest cities to the lowest towns. Indeed, we can notice that graphically Paris and the cities beyond 50000 inhabitants tend to be on the left while the others tend to be on the right, and we can find this result as well with Paris and the rural towns among the modalities with the highest contributions to axis 1. In a certain sense it can be linked with the results of the analysis concerning the accused individuals where we identified a similar axis opposing the rural and urban areas, but it was itself explained by the opposition between police (mostly urban) and gendarmerie (mostly rural) areas. Here again we can suppose that behind the rural-urban difference lies another main explanation of this axis: the difference in the treatment of infractions between police and gendarmerie. We have more evidence of this effect as we notice that the infraction’s label difference between the police and gendarmerie services are another main contribution to the construction of the axis (“vehicle theft” versus “simple vehicle theft” for instance). Another result with significant effectives and a noticeable contribution is the important number of thefts in individual or collective residences in urban areas. This could explain in part the difference between theft rates in rural and urban areas. Indeed, a garage or any kind of shelter offered by a residence is a logistical barrier built by the owner of the vehicle himself. However, cities who tend to offer too few dispensible space to own a garage seem to be better correlated with numerous thefts on public road (on the left of the axis 1) made possible by the higher exposition of vehicles to a theft on a public road. Beyond this, the other conclusions are quite similar with those obtained with the accused individual.
individuals: a higher representation of men (nonetheless lower than concerning the accused), a proportion of French citizens quite similar with the proportion of the population they represent.

The second axis seems more difficult to interpret. The most important contribution is the theft of unregistered vehicles. The main problem is the diversity of theft vehicles behind this nomenclature: boats, some trailers, light airplanes. This kind of vehicle we had only a few opportunities to study does not seem here to produce an axis that makes many senses, as it is associated with the youngest age intervals in the construction of the axis, which is not clearly confirmed by the statistics of this modality (they are younger than individuals’ victims of automobile theft but not than the victims of two wheels vehicle thefts). This axis rather tends to oppose the younger and the older victims seemingly. Younger victims seem to be more susceptible to suffer from two wheels vehicle thefts than automobile thefts. Nonetheless, in this survey, they don’t seem to be especially exposed to vehicle theft (33000 victims are between 18 and 30) which contradicts the results of the CVS survey. But we won’t try to interpret this result because we have no way to find convincing evidence for hypothesis about this difference. We will rather focus on the theft places and professions of the victims.

<table>
<thead>
<tr>
<th>Type of vehicle theft</th>
<th>AUTOMOBILE THEFT, N = 81,328</th>
<th>TWO WHEELS VEHICLE THEFT, N = 38,085</th>
<th>UNREGISTERED VEHICLE THEFT, N = 8,238</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Type of theft place</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Public road</td>
<td>60,436 (80%)</td>
<td>27,571 (79%)</td>
<td>4,185 (52%)</td>
</tr>
<tr>
<td>Individual or collective residence</td>
<td>9,091 (12%)</td>
<td>4,893 (14%)</td>
<td>2,235 (28%)</td>
</tr>
<tr>
<td>Place open to public</td>
<td>2,991 (4.0%)</td>
<td>1,651 (4.7%)</td>
<td>623 (7.8%)</td>
</tr>
<tr>
<td>Private place</td>
<td>1,186 (1.6%)</td>
<td>209 (0.6%)</td>
<td>134 (1.7%)</td>
</tr>
<tr>
<td>Natural spaces</td>
<td>962 (1.3%)</td>
<td>513 (1.5%)</td>
<td>472 (5.9%)</td>
</tr>
<tr>
<td>Other</td>
<td>295 (0.4%)</td>
<td>137 (0.4%)</td>
<td>123 (1.5%)</td>
</tr>
<tr>
<td>Public service</td>
<td>141 (0.2%)</td>
<td>137 (0.4%)</td>
<td>200 (2.5%)</td>
</tr>
<tr>
<td>Unknown</td>
<td>6,226</td>
<td>2,974</td>
<td>266</td>
</tr>
</tbody>
</table>

\(^1\) Source: database of the ONDRP about victims of major offences who lodged a complaint 2018 Champ: all recorded automobile theft of the database among the recorded automobile thefts, 60,436 or 80% were theft on a public road

\(^2\) n (%)
The first thing we can notice is the absence of significant difference between the place of theft of automobile thefts and two wheels vehicle thefts (we aggregated the simple and aggravated thefts recorded by police and gendarmerie under each one’s nomenclature). Here, the main determinant of the theft rather seems to be the easiness of access to the vehicle. A garage seems to be a logistical barrier for the thieves, and nothing seems to indicate that people who own a two wheels vehicle tend to have more garages than other individuals, but we should check it in other statistics before to affirm it. The significant difference is between the unregistered vehicles and the registered vehicles. It’s especially hard to explain this difference as this category of vehicle is not an especially clear category in the law. We have also great hardships to know which vehicles are included at which scale in this wide category.

Studying the profile of victims has here two main interests: beyond the possibility to identify weaknesses of the victims as well as preferences of the thefts, we can simultaneously get information about the impact of motor vehicle theft on the country. We face here two main victims. The vehicle owners who lose their vehicle can suffer heavy difficulties in their daily lives and the (sometimes long) durations before the refunding by the insurance companies is a period during which the owner can be in difficulty. Moreover, insurance companies also suffer of the consequences of these thefts as they must repay the vehicle to its owner. But here, only an access to their databases, that are the only ones to aggregate the costs of most vehicle thefts can inform us about the costs at the macro level. In France, this work of census and quantification of the impact of vehicle theft at the macro level is operated by the group of economic interests ARGOS, funded by the insurance companies, and recognized for its public utility in France.

We must here notice once again that these data do not include the thefts using embezzlement of rental vehicles or leasing vehicles. They are legally considered as fraud or as abuse of confidence rather than theft. We didn’t get data about the situation of rental and leasing vehicles embezzlement, but we got an interview with a member of the security staff of the rental company Sixt®. He was not the only of our interviewees to insist on the rise in the theft of rental and leasing vehicles observed in France since several years as several members from the OCLCO (central office for the struggle against organized crime). We nonetheless didn’t get precise quantifications of the phenomenon from Sixt® and didn’t achieve to make contact with leasing societies.
Figure 33: Summary scheme of vehicle theft as observed in the introduction: getting ideas of the steps where vehicle thieves can be stopped.
Barrier model

Part 2: Thinking about opportunities of logistical barriers against vehicle theft.

STEP 1: ENTRY

I Preventing the entry on national territory: limiting the access to easily accessible vehicles in different European countries.

Opportunities

Entry into France can be from mainland and overseas France, from a non-European country or from Europe. There are various modes of transport: boats, Channel Tunnel trains, freight trains, trucks, the vehicles themselves and planes.

One of the opportunities would be the control of trucks or trains carrying vehicles through several European countries. The other opportunity would be to enter the country with a foreign number plate and then change it to a French plate because of the obligation to be registered in France if the foreign individual’s vehicle remains in the country for more than one year.

Signals

These may be luxury cars registered in countries where rental prices are lower than in the destination country. It may also be foreign documents from a country where it is mandatory to have one’s documents constantly in the car.

Facilitators

The facilitators would be the differences in legislations among the EU member states, low-cost access to luxury rental vehicles and obligation to have one’s documents in the car in some countries.

Partners

As for the partners, this could be foreign rental firms, vehicle transport companies, customs officers, and legislator abroad.

Barriers

Lastly, we thought of barriers such as reinforced controls and harmonization of controls concerning rental vehicles and carrier of vehicles (as trucks) in the EU. Similarly, police and customs officers could be made aware about vehicle’s papers coming from countries where they can be stolen easily.
STEP 2: STAY

II Limiting the residence possibilities of itinerant thefts on the national territory.

Facilitators and opportunities

Freedom of movement is an important criterion for staying in France. Moreover, criminal networks can use national roads (without tolls) or motorways by paying cash.

Rule of law enables a certain level of anonymity, in particular General Data Protection Regulation.

Garage owners don’t always control the identity of individuals who want a new license plate. Consequently, they can usurp the registration of another vehicle.

Signals

A recent license plate (« WW ») can be a signal: criminal networks cannot go abroad with this plate. To preserve their anonymity, members of criminal networks use the least possible their identity. For instance, they will pay cash their garage rental.

Partners

Citizens’ awareness is needed to guide the work of police services, in particularly if they notice something unusual about the vehicles near their accommodation.

Barriers

There can’t be any police investigations and legal proceedings without filing complaint about a vehicle theft. However, police services can also carry out preventive work by identifying areas where stolen vehicles stay and plan actions: road checks, keeping, discreet surveillance and eventually search warrant.

STEP 3: INFRASTRUCTURE

III Identifying the infrastructural weaknesses enabling vehicle theft and designing adapted logistical barriers.

Opportunities

Infrastructures are a determinant factor for the intention, possibility, and success of a theft. While making the theft harder and more visible, adapted infrastructures can dissuade the thieves to commit crime at the same time. In some cases, this dissuasion is only temporary while it has long-run effects in some others.

Two major determinants of the success and intention of thefts among the infrastructures are the visibility and accessibility of the object to steal. Visibility increases the risk of being discovered during the theft and also the rate of violence of the theft in most cases, which implies a higher
probability of clearance and a higher possible judicial sanction. In the case of vehicle theft, violent thefts are marginal while they only represent around 2% of these thefts according to the OCLCO. We could here hypothesize that these are also in search of a very low visibility as they are largely non-violent. This hypothesis seems to be supported by our data:

**Moment of happening of the major offence.**

![Diagram showing the distribution of major offence occurrences across different times of the year and time of day.](image)

*Figure 34: Moment of happening of the major offence: most recent incident during the year for any household during the year.*

The main characteristic of the night is actually the low visibility of the theft during the night, which seems to be desired by the thieves. While stealing vehicles during the night they take much lower risks to be discovered and the need to use violence toward the victim. But the visibility at night is highly dependent on the infrastructures, especially public lightning. Nonetheless, some security systems are more efficient at night as well, especially when they increase the visibility at night like car alarms for instance.

The other determinant we had noticed is the accessibility of the vehicle, which determines the visibility of the theft as well as the necessary equipment and abilities. A low accessible vehicle will mostly interest the professional thieves who have already received a formation and usually the thieves who are looking for a precise car model that they can't find in more accessible places. We can also wonder if vehicle thefts are highly dependent on the accessibility of the vehicle. We can have partial evidence of the impact of accessibility on vehicle theft: we have already seen that high security systems could change the theft rate of a vehicle model. We can observe the influence of the theft places as well in order to study variables that partially reflect the impact of accessibility on vehicle thefts:

![Diagram showing the place of theft occurrences.](image)

*Figure 35: Place of happening of the theft: most recent incident during the year for any household during the year.*

---

56 Source: 2012-2019 CVS surveys
We can notice that vehicles parked on the public road or in open parking are more numerous among all stolen vehicles. The main difficulty is to deal with the fact that most vehicles are parked on the public road or in open parking rather in garages or closed parking. But we can wonder that the difference in proportion of people who park their vehicle in open parking and in garages is not from 1 to 10 and that there is a difference in proportion of vehicle thefts. The main difference between garages and open parking or the public is the difference in logistical barriers: stealing a vehicle in a garage implies to unlock or crash the garage’s door before unlocking the car. This is a great loss in discretion and potentially a process that needs more equipment.

We can finally notice that some infrastructures are very useful to transport the stolen vehicle once it is stolen. Among these infrastructures we can cite the roads, that are obviously very useful to move the theft vehicle. There are already existing infrastructures trying to intercept vehicle thieves on these roads like the LAPI (Automatic reading of number plates) in France. But some people we interviewed noticed a weakness in the LAPI system: the information collected by this system are only centralized at a local scale. Also, if we are facing itinerant thefts there could be a mismatch between the local folder of theft vehicles and the plate of the stolen vehicle while the vehicle is recorded as theft at the national scale.

We can finally notice that harbors may constitute a substantial opportunity for vehicle thieves. They are a major mean for exporting theft vehicles which can give a direct access to their markets for the thieves. This is nonetheless an opportunity and not a causal effect: we noticed higher vehicle theft rates nearby harbors only in the French harbor agglomerations. We also studied the French département with the highest vehicle theft rate: the “Bouches du Rhône”.

However, the possible hypotheses to explain this specificity Marseille are numerous: unemployment rate, poverty, urban planning. But it seems more relevant to examine which other cities are very affected by vehicle theft in order to explore ideas of possible hypotheses to explain this rate of vehicle observed in the “Bouches-du-Rhône”.

We were thus able to make this list of cities in the Bouches-du-Rhône that have vehicle theft rates beyond 6 per thousand inhabitants per year for at least one year between 2016 and 2022. Each city appears as many times as it has experienced years when the rate of theft was greater than 6 per thousand over the period studied. In order to better understand the specificity of these
municipalities, we have placed them on a map of Bouches-du-Rhônes which also shows the division into administrative districts of the department.

These cities are mostly located on the coast in urban areas. It is therefore legitimate to ask whether there are specific characteristics associated with the proximity of the coast or port infrastructure can explain these higher rates. Indeed, the proximity of the coast can also bring greater tourist infrastructure. Nothing excludes an influence of the presence of these havens on vehicle theft. However, we were able to study the characteristics of a type of resale vehicle theft: export resale theft, which can easily be assumed to take advantage of port infrastructure to facilitate export. It would benefit from the possibility of reaching its markets (Africa, Eastern Europe) and the availability of systems adapted to the mass transport of vehicles where it is possible to hide. Deepening these explanations easily leads us to a more precise observation of these cities. It can already be noted that the cities outside the district that have more than 7 flights per thousand inhabitants all have an industrial port except the Saintes Maries de la Mer, which we will consider separately as a place of pilgrimage, Aix-en-Provence, second most populated city and Aubagne.

We can still check if this correlation is significant by leading a short linear regression. We could then verify if the proximity with harbours is correlated with higher vehicle theft rates.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Estimate</th>
<th>Error standard</th>
<th>statistic</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>(Intercept)</td>
<td>3.312776</td>
<td>0.1670419</td>
<td>19.87914</td>
<td>0.000000</td>
</tr>
<tr>
<td>PortPortuaire</td>
<td>1.196415</td>
<td>0.3328688</td>
<td>3.596197</td>
<td>0.000474</td>
</tr>
</tbody>
</table>

This correlation is also significant at the 5% level, we can also seemingly identify a correlation. But this doesn’t imply that harbours cause higher vehicle theft rates: this effect is only perceptible in harbour agglomerations which vehicle theft rates are already beyond the national average: we can
also wonder that a harbour is an opportunity for existing criminal network rather than the cause of a higher vehicle theft rate.

**Signals**

Some signals can be considered as associated with an immediate and local high risk of vehicle theft. Among them we can notice thanks to several interviews that some groups of thieves often do patrols in a district before they steal a vehicle. It is especially frequent in the case when they are looking for a particular model of vehicle if this model was requested by some foreign importers. In such cases, groups of thefts are usually exploring some nearby urban districts looking for the vehicle model requested. In case of controls, these groups must own important electronic equipment, that are the overwhelmingly predominant theft methods nowadays (88% of the theft according to the theft cases of Coyote©). The thefts can moreover follow their victims as they use several theft methods that require a high proximity with the keys’ owner. Indeed, the relay-theft using relays to catch the signal of the key or some “mouse-jacking” methods that impeach the adequate closure of the vehicle require to be at only a few meters from the keys and also from their owner. A car following another one at night after it was exploring the district is also a potential signal of a vehicle theft to come.

Concerning the signals emitted while the stolen vehicle is being driven on the road, some vehicle thieves can be detected after their theft thanks to the number plates of the stolen vehicle. They indeed can change the vehicle’s plates only a certain time after the vehicle was stolen and are also vulnerable if the car is detected by LAPI systems before they had the opportunity to change the plates of the vehicle. But the LAPI system reveals important limits among which its very low ability to prevent vehicle thefts (compared to a police patrol), making it unable to diminish theft rates on the long run (even if it shows good results for the recovery of stolen vehicles)\(^57\). The other main limitation, as we noticed, is the low centralization of data about stolen vehicles in France which makes it especially complex to identify the position of the stolen vehicle on the long run. There are also only very few signals given by the thieves, except when dealing with individuals who keep the vehicle for their own use, especially for joyriding. We already saw in the literature how they could take very high risk and have very remarkable driving once they are on the road.

Finally, one last signal could be the presence of one or several individuals on a boat who bring recent and high value vehicles while leaving from regions with high vehicle theft rates like the Bouches du Rhône. There are considerable concentrations of vehicles in some areas in harbours like Marseille, while there are high theft rates nearby. Roll-off ports are an especially precious opportunity for the thieves, also the presence of individuals who are unable to justify the origin of their vehicles while trying to embark them on a ferry can hint a higher probability to find stolen vehicles in the roll off port in case of inspection by the customs, allowed to control the content of containers or to control the origin of some vehicles.

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Partners and facilitators

Several organizations or groups can be partners in the fight against vehicle theft as well as facilitators in their committing. Most of them can both support and limit the efficiency of the struggle against vehicle theft led in the European Union, depending on the circumstances and on their intentions.

The organizations committed in the organization of vehicle transport in harbours are simultaneously a facilitator and a possible partner for instance. Indeed, while they transport massively vehicles across Mediterranean Sea or the Atlantic Ocean, they transport most of the exported stolen vehicles in cargos or ferries. It is especially the case when harbours are equipped with a roll-off port which enables passengers to take their cars with them. This is simply explainable by the fact that a vehicle is easily transportable through a ship, whether it was stolen or not. Our interviewees mostly affirmed that theft vehicle transported by the sea were mostly in direction of Africa and could embark directly in containers that have Africa for destination. Most of the time, the exported stolen vehicles are hardly disponible in the country where they are exported as it becomes more rentable for the theft to be paid more for a vehicle that is not obtainable otherwise that when it is stolen. We could also consider simultaneously that transported or exported recent (to differentiate them from the “France au revoir”: occasion vehicles legally exported from France) vehicles, especially on models difficult to obtain in Africa should be controlled by these maritime companies making them an important partner. While there is currently few demanding controls to take one’s vehicle on a ferry, thieves can embark with stolen vehicle thanks to only their driving license and the vehicle’s essential documents. Controls could be reinforced, at least on some vehicle models that suffer the highest theft rates by inspecting some precise elements like the VIN (vehicle identification number) or some other easily repairable elements.

Similarly, customs could play a role in the struggle against the export of stolen vehicles. While at least 215,000\(^56\) vehicles transit through the port of Marseille every year, it would be of little use to control randomly vehicle containers while vehicle thieves precisely take profit of the very numerous vehicles present in the harbour to avoid controls. On the other hand, targeted VIN controls could be very useful. These controls could be decided in function of the vehicles present in the container: focusing on SUV and city cars, especially when they are recent and exported in countries where they are not easily available.

The other police services play a role in the cases or during the time when the stolen vehicle remains on the national territory. Indeed, it is very rare that vehicle thieves are arrested abroad by the French authorities (less than 100 individuals were arrested at more than 1000 km from the theft place in 2018). At the opposite, they can follow a stolen vehicle if it is identified by the LAPI system at different places of the territory. More locally, urban polices like municipal police could reinforce the controls in the places where the visibility is the lowest, especially dark streets, while municipalities could adapt the urban planning.

Finally, car owners could play a role thank to awareness raising. The best way to avoid thefts seems to use (for the individuals who have one) the garages of their residence as much as possible, as they seem to be correlated with lower theft rates as we have seen before. Here again, awareness raising can be localized and target the districts where vehicle theft rates are the highest. Moreover, many

\(^{56}\text{GRAND PORT DE MARSEILLE FOS 2022}\)
collective residences in areas where there are many vehicle thefts (Paris, Marseille, Seine Saint-Denis, ...) have open parking. It could be relevant to encourage the trustee and landlords responsible for these residences to equip the parking regularly targeted with fences.

**Proposals of logistic barriers.**

- Create a legal procedure that implies systematic discussions between the owners of a collective open parking and the authorities when several vehicle thefts take place on the same parking (the number of necessary thefts to launch this procedure must vary in function of the size of the parking). These discussions will tend to examine the possibility of installing local and adapted logistic barriers.
- Edit a list of the most frequently stolen vehicle models every month, specifying which ones are easily available in the destination of a ship and demand from the maritime companies to control the VINs of these vehicles during the embarquement. These VIN can then be transmitted to the police or gendarmerie local forces and matched with the FOVES (stolen vehicle folder) to check if the vehicles are stolen or not.
- Car owners could be encouraged to equip their vehicles with car alarms. The cost of a car alarm is now usually around 300€. This is not a neglectable price for many car owners, but it could be very relevant to negotiate with insurance companies a decrease in their premiums for car owners who accept to get equipped with such alarms. We must nonetheless notice that we are in the moment unable to estimate the actual efficiency of alarm systems against vehicle thefts. This would need an impact study. We only wonder that these alarms could be especially useful as thefts mostly take place at night and taking profit of the low visibility at night.
- Encouraging municipalities to equip the areas with the highest vehicle theft rates with urban systems that increase the visibility in the street.
- Sensitizing the car owners who have home or building garages to the usefulness of stationing their cars in the garages rather than parking it on the public road or in open car parks.

**STEP 4: CRIME**

**IV Blocking the criminal during his theft through logistical barriers**

**Opportunities**

The moment of the theft is through many aspects, the more significant moment of the process accompanying vehicle theft. This is a very important moment especially because this is the common phase that any theft cannot avoid, including the fact that the theft is only motivated for using it. It is probably the best moment to block the thefts for use, limited by their low equipment. They are also extremely “attentive” to logistical barriers during this phasis of the theft. But we must first observe the opportunities left to the thieves that make the theft possible. Actually, here disappear the similarities between the different types of thefts: professional thieves equipped with electronic systems can unlock cars after a few minutes, with very diverse possible techniques, while usage thieves must find very exposed vehicles.

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59Average price estimated of the vehicle sold by Stellantis©
We also noticed that the theft of a vehicle may require at least two (often three) elements if there is no major negligence on behalf of the vehicle’s owner (keys left in the car, open windows, …). Such negligence, in contrast, are the opportunities of the usage thieves. We can sum up these three elements as the following ones, that are functionally necessary to commit a vehicle theft:

- An adapted equipment for the theft, which enables him first to get inside the vehicle and then to be able to unlock the anti-start systems so as to drive the car.
- In most cases an adapted ‘qualification’ formation to be able to use this equipment. These ‘qualifications’ are usually quite short-lived (around one month according to Mullins and Cherbonneau\(^{60}\)) but necessary to the use of the equipment. They are more long-lived usually when the theft target special vehicle models which security equipment are more recent and innovative (also during a certain time-lapse the equipment to steal it is not easily available).
- A security breach in the car’s security system. Usually there is a necessary correspondence between the security breach and the thieves’ equipment. This breach can be specific to some vehicle models as well as similar with all models equipped with a same technology.
- We will first study the questions concerning the equipment of the thieves and try to quantify the cost of an equipment enabling vehicle theft, here we will rather focus on the cars) to check if we can really consider these equipment as “opportunities”. During its theft observatory, the firm Coyote© identified 4 methods who have become by far the most common methods of vehicle theft:
  - The ‘computer theft’ (or ‘vol au calculateur’) is based on a technic which consists in replacing a car’s computer by a hacked one, which neutralizes the anti-start system. This method is less discrete and implies that the thief must open the door with other means and is quite costly. This is also not a very common opportunity. It is a bit more efficient with two wheels vehicles.
  - In the category “mousejacking”, it is relevant to include the modus operandi that consists in buying a virgin or pre-programmed key which will enable the theft to open the vehicle’s external securities (door, safety locks, …) and start it without major problems. To get virgin keys, there is no special procedure, but the thief will need to find the OBD (diagnosis) plug and program the key in function of the car. A pre-programmed key is more difficult to get but they can be bought abroad with only the serial number of the vehicle which is now visible on the windshield of several car models. This is the most discrete technique of vehicle theft and there are many opportunities to buy such keys for low prices on the Internet: here are a few examples through screen captures of several legal internet platforms: Ali Express and Ebay (Ebay even proposes keys for the precise vehicle models researched):

This is a tiny example of the easiness to get such keys on the internet for very limited costs:

- The OBD plug theft, consists in using the diagnosis plug of the car to reprogram the car or program a virgin key to inactivate the anti-start system. This is an efficient method when the thief has specialized software. It is especially efficient when this plug is easily accessible on a vehicle model. An indication of the significant effect is the decrease of the theft rate of Renault© vehicles, especially the Megane and Scenic when the firm decided to hide the diagnosis plug rather than installing it under the central box (between the two front seats). These two models both left two places (from 3rd to 5th and from 4th to 6th) in three years (necessary duration for the replacement of the fleet) if we believe the Theft observatory of ARGOS data.
The relay theft requires two thieves among which one will follow the car owner to catch the signal of the owner’s key. This signal is then transferred to the relay of the second theft, which reproduces it and enables him to unlock the car and anti-start system. The main weakness of this system is that it only works with vehicles which keys emit waves constantly, that is to say cars equipped with keyless-go (or keyless-start) systems. These cars are especially exposed since most cars on the vehicle market equipped with this system revealed to be highly vulnerable in theft tests realized by the German drivers’ association ADAC61. If we extract the results of these theft tests led with different vehicle models with relays buyable on the Internet to keep the three most theft and the three most vehicles in France, we get the following result:

<table>
<thead>
<tr>
<th>Vehicle model</th>
<th>Achieved to open the car illegally</th>
<th>Achieved to start the car illegally</th>
</tr>
</thead>
<tbody>
<tr>
<td>Peugeot 208</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Renault Clio</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Peugeot 2008</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Dacia Sandero</td>
<td>Impossible to get keyless go system on this model</td>
<td></td>
</tr>
<tr>
<td>Citroën C3</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Toyota Prius</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>DS7 Crossback</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Renault Clio</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Renault Megane RS</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Renault Megane</td>
<td>Yes</td>
<td>Yes</td>
</tr>
</tbody>
</table>

Figure 40 (left): Results of the ADAC’s test for the five most sold vehicle models in France

Figure 39 (right): Results of the ADAC’s test for the five most theft vehicle models in France

We can also very easily notice the opportunity that relay theft can represent for car thieves a major opportunity to steal vehicles without taking high risks once again.

But the theft opportunities do not only concern classic vehicle thefts. Thieves can get cars by other means without directly stealing them. The OCLCO and the security staff of Sixt® who we met for interviews both insisted on the importance of the embezzlement of leasing and rental locations vehicles. The theft observatory of ARGOS, based on data furnished by most of the national insurance companies (all excepted one) estimate that there were 26,000 embezzlements of rental and leasing vehicles in 2020. This also represents a substantial part of the vehicles acquired with

61https://assets.adac.de/image/upload/v1645525388/ADAC-eV/KOR/Text/PDF/Keyless_Liste_500_Autos_rjqzty.pdf
illegal methods. This is due to the existence of a real criminal opportunity, since the individuals who commit such thefts are not considered as vehicle thieves but as fraud or breach of trust. The possible associated legal sanctions are really lower for these offences. In theory they all imply to be sentenced to 5 years in jail but actually the very wide majority cases of swindlers or breach of trusts to suspended prison term while most vehicle thieves are convicted to simple prison sentences. Among the individuals convicted for vehicle theft, 50.2% were sentenced to prison sentences while 30.8% of the individuals convicted for swindle were sentenced to prison. This is also a less risky major offence for the criminals and an opportunity as the required equipment is less important. As a revenge, they often need a figurehead to rent or lease the vehicle and manipulate him or her to make the figurehead responsible for the major offence.

Signals

Among the main signals identifiable, most are the signals of the short-term preparation of the theft in terms of equipment. Usually, the main signal is the fact that an individual is gathering equipment necessary for a vehicle theft. The individuals who need to buy virgin keys for professional reasons are usually garage owners, but they can collaborate with criminal networks or there could be a lack of controls during the sale of the keys if they are bought in countries where the jurisdiction is more lenient. Presently, buying virgin keys, even with a serial number is usually the sign of a suspicious activity which deserves at least to be considered as a signal.

But in a more global way, there are signals of the presence of suspicious activities on all website where equipment susceptible to be useful for vehicle thefts are sold. The other examples are the relay. But these are definitely not sufficient evidence to consider someone as a member of a criminal network. Though, some people deliver 'training' to vehicle theft on the internet. The OCLCO confirmed during an interview that there is clearly no need to find the minority of individuals who use the dark net to offer these skills as most of them are delivered on social networks. According to their experiences Snapchat© is from far the most concerned social network/messenger system. Another potential signal is to observe two or more individuals staying for one nearby the owner once he is parked and for the other nearby the vehicle. Especially if the one who follows the owner holds a wide bag, which is a common mean to hide relays. This method is indeed necessary to achieve a relay theft.

Facilitators and partners

We have already noticed the easiness to get access to equipment susceptible to be used for vehicle theft on legal social networks and internet platforms. But we cannot directly reproach these platforms that sell these equipment as they are not illegal. Virgin keys are bought by legal users who try to replace their car’s keys as well and it is not sure that making these keys illegal is actually a good solution in terms of public interest. But these keys are clearly not the only theft equipment available on these internet platforms: jamming systems, relays, … We must also conclude that these platforms are simultaneously a facilitator for vehicle thefts and a potential partner if they accept to cooperate in order to limit their ability to facilitate the thefts. They are indeed the only possible partner who is able to identify the buyers of the virgin keys. The main difficulty is to collect and treat this information in a strict respect of the GDPR (General data protection regulation).

\[62\] French Ministry of Justice, 2019
Car manufacturers are a necessary partner in the struggle against vehicle theft as a wide majority of the security systems installed on vehicles are dependent on their installation by the manufacturer. The different security breaches identifiable on a vehicle model are similarly very dependent on their design by the car manufacturer. We already talked about the breaches in the keyless-go system or these due to the location of the OBD diagnosis plug, but these are examples of situations in which the action of the car manufacturer could overcome these problems. But depending on the problems to fix, the cost for the car maker can be highly variable and the propositions of logistical barriers must take this in account.

Straw persons are in a very special position as they are often victims of the criminal network but nonetheless realized the theft. Our interview with a member of the security staff of Sixt© enabled us to identify their role in the swindle to get fraudulent rental and leasing vehicles. It has become very difficult to falsify documents to steal a vehicle to a rental company as they are now equipped in most cases with machine that analyses the MRZ (machine readable zone) of driving and identity documents. On the other hand, he noticed that criminal networks could use figureheads (often manipulated) to make them rent the vehicle under their names before taking it to the straw person and never giving it back. In some situations, this person can enable the police and gendarmerie forces to find back the leaders of the network, but they seem most of the time to be unable to identify the actual identity of the members of the criminal networks. In a few cases they are foreigners with low abilities in the country’s language including the case of a network who hired Ukrainian peasants but here again the offenders seem to me in a wide majority French.

Finally, we can notice that some individuals offer training sessions to vehicle theft. The interview with members of the OCLCO led the interviewees to notice that it was very easy to find such tutorial on Snapchat and that there was clearly no need to use the dark net to get such training courses. In this case, these facilitators are quite exposed since they explain their techniques while they are easily visible on the application. We must notice that they are essential in the training of criminal networks involved in vehicle theft since they are usually the individuals who explain to the others the different existing methods, how to apply them correctly and in most cases give the software necessary to hack the vehicle’s system when it is necessary.

**Suggested logistical barriers**

- The first logistical barrier we could propose is to reinforce the collaboration with the online traders selling systems that can be used for vehicle thefts. There could be a more important control of the access to virgin keys, jamming, and relay systems on the legal market. Prohibiting the sale of these systems could have important costs for some citizens but more controls could be more efficient. Recording the names of the individuals who buy systems could be a violation of the GDPR laws. However, the requirements of diverse written proofs of exerting an activity needing such equipment or having lost one’s keys, could be useful. Those documents could then be required to buy such equipment.
- An awareness raising of the individuals who have profiles that make them susceptible to be a straw person about the possible manipulations which they can be victims of. For instance, car renters could give systematic explanations to the individual renting cars about the risks of lending the rental car to someone while printing this information in their shops.
Adding a new mandatory equipment for the vehicles with keyless-go systems could easily fix the problem of the thefts with relays. Indeed, they are enabled by the continuous transmission of waves by the key (that can be easily caught by the thieves). Very simple systems can impeach this transmission like anti-wave pockets. Anti-wave pockets’ cost is around 10€, all keyless-go vehicle owners could also be equipped with such pockets and also fix the problem of the security breach of cars equipped with keyless-go systems.

A dialog could be launched with the car manufacturers about the importance of three elements: limiting the accessibility of the OBD plug, stop putting the VIN directly at the bottom of the windshield and the installation of a sound systems signalling the driver when he left his keys in the ignition.

We could finally collaborate with the messaging and exchange platforms or apps that enable some individuals to propose ‘training courses’ to vehicle theft. They could try to suppress these contents or ban the individuals who offer such services, especially concerning platforms where videos play an important role (Snapchat, Tik Tok, Instagram).

STEP 5: STORAGE

V Limiting the storage possibilities to dissuade the theft of the vehicle and increase the probability of recovery of the stolen vehicles.

Opportunities

There are many possible techniques for the professional thieves to avoid or limit the risk of being geolocated which has become the main risk for vehicle thieves. Their main preoccupation during the storage seems to be the limitation of their visibility and risk of being identified once again. They can hide the stolen vehicle through different means, from the most mechanical, taking profit from the terrain to the most evolved solutions to limit the possibility to recover the vehicle theft. Indeed, several institutions are fully devoted to investigation to recover stolen vehicles: some departments of the police and gendarmerie (a cell in the OCLDI, another in the OCLCO, …) and other firms or associations like the ARGOS or Coyote. There is also a risk for the thief to be geolocated which they can tend to limit by putting the vehicle under shelter, far away from them to be sure that it is not geolocated at short term. This practice called the "sèche" limits the risks for the thieves and once they consider themselves as being in safety, they can try secondly to minimize the risk for the vehicle (usually a network can steal tenth of vehicles in its career, the loss of a few vehicles is also rarely decisive).

They can also disguise the vehicle by different means during this sèche or just try to hide it. In urban areas the dominant mean seems to be the use of underground garages and car parks. In the countryside, there are examples of the use of containers during the sèche. We will first rather focus on the underground urban garages and car parks, where our interviews with the members of Coyote and the OCLCO declared to recover the most theft vehicle. Their overrepresentation could nonetheless come from a bias as most Coyote’s customer and actions of the OCLCO take place in urban areas. We cannot confirm it but this overrepresentation would be coherent with the widely urban characteristics of vehicle thefts. Moreover, there are several advantages for the thieves to
park the vehicles in such areas: it is now possible to localize a vehicle thanks to its GPS system. But these systems are highly vulnerable as they can be easily scrambled, especially because they don’t work underground. The possibility to park these vehicles underground is also an opportunity to prevent the recovery of the vehicle (and of the thief in some cases but they usually keep away from the vehicle for a few days after the theft). This is different for some vehicles equipped with more evolved geolocation systems (usually not installed by the car manufacturer) that represent a higher risk to be located for the thieves. In this case they can rely on accomplices called “cleaners” who are specialized in searching these systems in the vehicle and removing it. This situation usually involves rather luxury vehicles or rental and leasing vehicles submitted to high theft risks. In such situations, the recovery of these vehicles happens in most of the cases, but the criminals remain rarely caught. The presence of such “cleaners” remains nonetheless an opportunity for the thieves. Finally, the “sèche” can take place in the countryside while making the GPS geolocation useless: putting the vehicle in a container place it in a Faraday’s cage in which it cannot emit signals anymore. We will notice later that this type of Faraday’s cage really shows some limits.

The other storage possibilities that do not include a “sèche” period cannot be considered the same way as they already expose the thief and can lead to an interception thanks to the geolocation. In such cases the thieves must be faster than the authorities while trying to directly export it in containers or while trying to dismantle the vehicle as soon as they can. In such cases it is difficult to imagine other logistical barriers that the one already imagined limiting the theft or export possibilities.

A second opportunity related to the storage is the possibility to disguise the stolen vehicle during the storage. This disguise includes two steps:

- Disguising the vehicle is essential at least for vehicle supposed to remain on the national territory to be sold. Conversely, it is useless for vehicle that will be dismantled as they will be unrecognizable. Concerning vehicles to be exported this is a useful step but not actually a necessary one as there are many countries where the vehicle will not be correlated with stolen vehicle alert (the French FOVES or Interpol’s databases). It is nonetheless preferable in some situations to cross some borders with a vehicle that is not recognizable as stolen. Julie Roy also studied a network (the “Boris” network) that didn’t include any make-up activity while another (the “Sirène” network) had 6 individuals specialized in the vehicles’ make-up. Both networks were nonetheless focused on exportation activities.

- There are also usually specialists in vehicles’ disguising in the relevant criminal networks. They usually transform the most identifiable parts of the vehicle. This also includes a change in the vehicle’s colour and a change in the number plates in most cases. The vehicles paintings are quite easily accessible and not very costly, but they leave traces on the vehicle. Concerning the vehicle’s number plates, it was previously quite difficult to get them when the “prefectures” were the only institutions allowed to deliver them. But for a few years, garages’ owners are allowed to add new number plates to a vehicle, including temporary plates (identifiable as they begin with WW). Also, if a criminal network has accomplices among garages’ owners it can become very easy for them to get new plates for a stolen vehicle.

- But if these two steps can change deeply the appearance of a vehicle and make it unrecognizable during a fast inspection, there remains one specificity in cases where the vehicle is the object deeper controls. Indeed, the VIN (vehicle identification number) is difficult to modify as it is engraved in the several parts of the vehicle (usually the chassis, below the windshield,...). It can also not be removed without major damaging the vehicle. In some cases, the thieves can alter the VIN but this is usually insufficient as the traces of the filing remain visible. In some very rare cases that were told by the security staff of Sixt®, it was observed that the thieves replaced the chassis or windshield with similar parts from other vehicles that were supposed to be destroyed but there is a clear mismatch between the vehicle associated to the VIN and the stolen vehicles in such situations, which is identifiable thanks to the stolen vehicles’ files (FOVES in France).

- Attributing new documents to the vehicle is usually very difficult since it has become complex to make-up false vehicles’ documents. It remains possible but costly as the experts able to do such tasks are rare and highly demanded by many criminal businesses. Moreover, we have very few information about these cases since the clearance rate of the cases of documents’ falsification are very low (only 9 individuals have been accused of false declaration to get false vehicle documents in 2018 according to the ONDRP but many other accused might have been classified as false document authors or users without précising the relationships with vehicle theft, but we have no information about it). The other possibility for the criminal network is to steal vehicles' documents or to buy it on the internet. This procedure has been used in the past by several famous criminal networks. The fact that it is possible to buy stolen vehicle documents on the Internet has been revealed by the arrest of a criminal group in the Val d’Oise which bought stolen documents from Belgium. They bought Belgian vehicle documents recently stolen and could then steal a corresponding French vehicle and then gave it the new number plates and colors of the Belgian vehicle. This was made possible by the obligation for Belgian drivers to have their vehicle’s documents in their car which makes them easy to steal. This is only an example of the different methods to steal vehicles’ documents.

**Signals**

Most signals concerning the storage of stolen vehicles concern the storage place. Indeed, it is usually the specificity of vehicles present in a precise place that signals the presence of theft vehicles. We have already seen that garages and containers were two preferred storage places for theft vehicles. We also noticed that most theft vehicles are now stolen by organized criminal networks responsible for numerous vehicle thefts (tens or even a hundred of thefts sometimes). There are also several consequences that we identified at the same time in our interviews. The stolen vehicles are often recovered by the different teams in charge of their recovery (OCLCO, ARGOS, Coyote, ...) in underground garages or car parks but the specific signal is the presence of several similar vehicles’ models nearby one another. The high specialization of the thieves and the fact to get commands from abroad usually lead them to accumulate several similar vehicles or at least resembling vehicles (several SUV, several city cars, ...). The OCLCO had for instance identified during the dismantling of a network specialized in the theft of Range Rover Evoques a car park where they stored their vehicles. But when they recovered the vehicles, they discovered in the meantime that two other independent networks without any relationship with the first one stored simultaneously stolen Range Rovers in the same parking. Those three networks all stored their
Range Rovers the one next to the others. This is an example of the suspicious aspect of numerous similar vehicles parked the one next to the others.

The equivalent signal in the countryside, as we have seen it before is the presence of abandoned containers in the countryside. As they are useful as Faraday’s cages, vehicles can be left into these containers during the “sèche” period. These containers can be quite identifiable as they are usually left in different quiet places and contain vehicles if they are open. We must nonetheless notice that the use of these containers is less common than the use of underground car parks to store the stolen vehicles.

Finally, there is one last signal susceptible to indicate a stolen vehicle. We already noticed that GPS signal were the easiest way to locate a stolen vehicle. But the thieves can be equipped with GPS jammers, that are really easy to find on the internet for low prices just like the example we show here.

These jammers enable the thieves to avoid the geolocation with the GPS systems, but they are a signal as well. Indeed, the wave frequencies they use to block the GPS signals are identifiable with new systems. These systems can also identify vehicles equipped with such GPS jammers. In Germany, most tollgates are now equipped with such detection system with seemingly encouraging results.

Facilitators and partners

There are, now, several facilitators whose action is directly related to the opportunities we previously listed. The containers and shipping companies associated are the main providers of containers. In some cases, they can sell it directly to the thieves, due to lacks of control or after having been presented with false documents. But in most cases, it is not especially complex to obtain containers from the very high diversity of activities and containers consumption of different harbours like Marseille or Le Havre. Such containers can be bought for 2000 to 4000€ usually. But
the use of containers seems too limited to use important means in the control of the enormous containers’ traffic.

Although, among the main possible partners there could be a participation of parking owners. Several criminal networks involved in vehicle theft have been dismantled thanks to the collaboration of parking owners who discovered abandoned vehicles in disused car parks or stolen vehicles in private controlled car parks. There could also be a reinforced partnership between the closed parking’s owners and the authorities.

Possible logistical barriers

- It is possible to think about the installation of jammers’ detection systems at the tollgates. The deployment of such systems is nonetheless quite expensive, it could also be necessary to put impact studies in place to assess the cost and benefits of such systems in the countries already equipped with such systems. These systems can identify the vehicles equipped with GPS jammers, vehicles that have higher probabilities to be stolen vehicles and also be the object of priority controls. Such systems are already being put in place in German, which could be an opportunity to assess their efficiency to reduce vehicle theft rates and recover theft vehicles.

- It is possible as well to create small, dedicated forces controlling the car parks in the cities that are the most exposed to vehicle thefts (Paris, Marseille, …). They could regularly inspect some closed car parks owned by different stakeholders, identify the suspect vehicles (several similar model in a limited area, partly dismantled vehicles, …) and check their VIN with the help of the FOVES (stolen vehicle folder). They could intervene as well in case of a signalling by parking owners’, inhabitants, lessors, also in cooperation with local stakeholders.

- The installation of upgraded geolocation systems on vehicles could be a potential method to increase the rate of recovered vehicles and limit the criminal opportunities. The main problem is the cost of the installation of such systems (around 200€ for the installation and then 10€ per month for the maintenance by the most influent firm on the market). It seems also quite complex to generalize such a system for all vehicles in the country. However, their cost can be limited through a negotiation with the insurance companies. They could offer decreases in the insurance costs for the vehicle owners equipped with such systems, which could be considered as a legitimate counterpart since they save money when an owner gets back his vehicle rather than being refunded. Even when the owner must be refunded (one month after the theft according to the French legislation) the insurance company is still interested in recovering the vehicle since the company becomes owner of the vehicle. Such decreases could be negotiated or legally imposed to the insurance companies if negotiations revealed to be fruitless.

- There could be an awareness raising through the transmission of information to the police and gendarmerie authorities about the signals of possible theft vehicles. Concerning the gendarmerie, it could focus on the abandoned containers and concerning the police focus on the suspicious stationing in garages. But there could be another transmitted list enabling to identify the details characterizing a disguised theft vehicle (often traces of painting on the door seals).
STEP 6: TRANSPORT & TRADE

VI The high differences in possibilities and modalities of resale and transport opportunities between the theft destined to export and direct resale.

Opportunities

We had already the opportunity to focus on the importance of the harbours in the export of theft vehicles and in their trade. Especially the harbours equipped with roll-off ports. Some harbours like Marseille remain essential in the transport of stolen vehicles if we consider the French infrastructures. The other aspect of vehicle exportation is the arrival of the vehicles in the regions where they are exported. We cannot precisely study quantitatively the export of theft vehicles and neither get many qualitative information about the destination of stolen vehicles. Nevertheless, we can study the export of occasion vehicle from France and its neighbours to the nearby countries.

There are two main destinations for the second-hand vehicles exported from France and Europe in general. Africa is the first one. Among the 3 to 4 million vehicles exported from Europe to Africa every year, a quarter passes through the port of Anvers and some authors like Martin Rosenfeld\(^64\) consider (though it is quite speculative) that half of occasion vehicles are traded in the district of Heyvaert in Brussels. This is a real criminal opportunity since the criminals can disguise the vehicles in this considerable number of exported vehicles but an opportunity for the authorities as well since a few places centralize a wide part of the exportations. But the stolen vehicles are usually quite recognizable from the other second-hand vehicles. While most of these exported vehicles are very old and abraded\(^65\) the theft vehicles, as a revenge, are usually recent and demanded vehicles. Once they have left Europe, these vehicles are exported to African harbours among which the two most important are Lomé and Cotonou (more than 400,000 cars transit in Cotonou every year according to local customs), here again since these harbours have roll-off ports (and since there is no custom fees in these harbours). Once they have landed, the vehicles simply take the roads to their destination, usually neighbour countries like Benin or Burkina Faso mostly. Intercepting the stolen vehicles in the harbours is clearly possible, especially since there are enormous vehicle markets in the harbours of Lomé and Cotonou. But similarly, there are very wide vehicle markets in the destinations of the vehicles, that are usually African cities of neighbour countries of Benin and Togo. Among these cities there is Ouagadougou in Burkina Faso for instance where there are numerous vehicle markets which high centralization can be a chance for the thieves as well as the investigators:


\(^{65}\) United nations Environmental program (2019). *Global trade in used vehicle report*. UN press
The other main destination of second-hand vehicles exported from France and western Europe is the eastern Europe. The other main destination of second-hand vehicles exported from France and western Europe is the eastern Europe (seemingly mostly the countries that are not members of the European Union to avoid the controls launched through European collaborations). Many articles of the literature insist on the organized crime from Albania but none of them demonstrate a higher representation of Albanians among vehicle thieves. Our statistical results rather tend to indicate an overrepresentation of French thieves. However, these thieves can have contacts and commercial outlets in eastern Europe. The main difference in this traffic is that it uses the European roads to transport the vehicles, which would be impossible if the destination was Africa. The networks often use mule to drive the cars all along the European roads. It would also be of little use to intercept vehicles at this moment since the mules are considered as “sacrificeable” members of the network by the other members. However, we can notice here again that there are massive markets for second-hand vehicles, including stolen vehicles, in Eastern Europe. A famous market is the market of Tirana in Albania with thousands of vehicles for sale. Here again this high concentration of vehicles is an opportunity for the thieves but can be an opportunity for the authorities as well.

But these are only examples of the transport and trade of the exported theft vehicles. We must not forget that many vehicles remain on the national territory as well. We can distinguish two main possibilities in this case. The first possibility for the thieves is to leave the vehicle intact. In this case it is quite easy to transport the vehicle once it has been disguised since the vehicle itself is sufficient to drive. But we have seen thanks to the statistics about clearances that a wide majority or recovered vehicle that were recovered in France were recovered between 0 and 50 km away from the theft place. Since the vehicle remaining in France are by far those with the best recovery rates, we can consider that this different is quite interpretable as a real overrepresentation of vehicles remaining nearby their theft place. There is also little interest in considering the transport of these theft vehicles for less than 50 km (also in a short time lapse, with little interception possibilities, ...) as it is difficult to find logistical barriers in this case. Thinking about logistical barriers during the resale will probably be more relevant.

But we must differentiate them from the vehicles dismantled in salvage parts. It becomes obviously impossible to intercept such vehicles. This is here a case where the dispersion of the vehicle’s parts makes it extremely complex to intercept them during their transport. This a major criminal opportunity, it is also more relevant here to target the profits that can be obtained from these parts.

**Signals**

As we noticed previously, the constant and important traffic of second-hand vehicles between Europe and Africa or Eastern Europe is an opportunity for the thieves. But there is an important weakness in this system: the theft vehicles are very different from the other second-hand vehicles exported to Africa. While most of the second-hand exported vehicles are ancient and impaired with seemingly a preference for saloons (see the report of the United Nations environment program previously quoted), the stolen vehicles are usually recent SUV and city cars. Among the five most stolen vehicle models in France, they all appeared after 2010 and three appeared after 2015. This situation is clearly the reflect of important environmental and economic inequality problems, but it nonetheless creates a clear difference between the theft vehicles and the other exported vehicles. This is also a signal to observe such recent SUV of city cars in ships at destination of Africa.

Another possible signal concerns the license plates. As it was identified by Julie Roy, there are exportation networks that do not disguise the vehicles. In this situation, the signal is simply the presence of an exported vehicle with the number plates of a vehicle declared as stolen. This can happen in case of an exportation or for vehicles for export or destined to stay on the national territory but inspected while they are still not disguised. In the second case they nonetheless remain undisguised only for a short period. But during this period or if they are never disguised the vehicle can be identified as stolen thanks to the corresponding of its plates with the FOVES. This corresponding with a stolen vehicle recorded in the FOVES can be noticed by a LAPI system for instance as well as by police agents.

We can moreover note that several interviewees shared that many recovered stolen vehicles, when they were disguised, were equipped with plates beginning with WW. This is clearly an important signal since this must identify the newly licensed vehicles, which makes no sense for a second-hand vehicle. Such plates on vehicles supposed to be exported and to be second-hand vehicle is also a signal that the vehicle may have been stolen.
Facilitators and possible partners

There is a very specific difficulty in the identification of facilitators for the transport of stolen vehicle: there exist no data that enable us to know how many stolen vehicles lie between the classic second-hand vehicle exportations toward Africa. These massive exportations are clearly a criminal opportunity, and these vehicles are partly obligated to go in the same harbours to be unloaded and then transit to the destination of the vehicle. We have nonetheless no evidence to affirm that the second-hand vehicles traders are linked to vehicle theft. Martin Rosenfeld in a summary article identified nine key professions involved in the transport and trade of these second-hand vehicles. Among them, we got especially interested in five of them. We can notice that the first five among them can be facilitators as well as partners since they can exert controls and procedures discouraging vehicle thefts:

- The “garagiste” is maybe the member of this system who has the highest responsibilities toward vehicle theft. Indeed, he is in charge of buying the vehicles to European owners, garages, retailers. So, he is the one who can take or not the decision to buy a stolen vehicle or not and proceed with its export to Africa. The precision of their controls and procedures is also determinant. Rosenfeld considers that half of the European “garagistes” operate in the district of Heyvaert in Brussels.

- The shipowner: he is the main condition for the possibility to export the vehicles since the vehicles could not leave their origin country without his support. The main shipowner assuring transits from western Europe to Africa is the company Grimaldi©.

- The consignee can be an employee of the shipowner as well as an independent entrepreneur. He is supposed to lead all the necessary administrative procedures allowing to embark and transport the vehicle.

- The African customs operate regular controls on the vehicles imported from Europe. But they have no means to identify stolen vehicles (they can’t identify the VIN numbers in some cases, they have no access to the European stolen vehicles databases, …). Moreover, their very low wages make it possible for the thieves to corrupt some of them in case of difficult inspection. They moreover usually employ assistants who are paid only with the money coming from corruption. They do not have the reflex to consult Interpol.

- The vehicle park’s owner usually establishes their wide car parks outside the cities with a lot of infrastructures for housing, eating around the car parks. The examination of a car park containing vehicles is dependent on their cooperation.

We can similarly notice the role of the mules in the transport of theft vehicles, this time rather in direction of eastern Europe. They are clearly rather facilitators than partners. An interviewee of the firm Sixt© noticed that even when they are caught by the authorities, they rarely know many

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members of the criminal network or know false identities. This is also complex to intercept them on the European roads and still more complex to get information from them.

Recommended logistical barriers.

- The high concentration of vehicle export infrastructure in the district of Heyvaert makes it possible to promote a task force in charge of controlling the proper implementation of the legal controls and procedures against vehicle thefts by the previously identified stakeholders of export, especially the “garagistes”. They could operate random inspections on suspect vehicles in this area as well provided that they get the status of administrative police. This task force could be composed with members of different police services of the European Union (maybe rather customs’ members since they have special authorizations as administrative police like the right to control goods randomly without a mandate) and have access to all stolen vehicle databases of the EU member states and Interpol’s database. Their job would be made much easier by the centralization of most exportation activities in this district.

- Most theft vehicles imported in Africa or eastern Europe beyond the EU are imported to get lower prices or, in some cases, to get unavailable vehicles models in a lot of African countries. It could then limit the market for vehicle theft if there were partnerships with some local legal vehicle dealers so as to make them able to compete the vehicle thieves in monopole of the import of some vehicle models. They could take profit of this situation to get new vehicle models in partnership with the European car manufacturers or to get some financial support in counterpart for a struggle against illegal import.

- There could be a task force with European and African members in charge of controlling the vehicles stored in the biggest vehicle markets in the African harbours and cities.

Figure 42: Cureghem

Caption translation:
Main receivers
Ecluse terraces (Citydev)
Anderlecht slaughterhouses and market
« Garage cells » perimeter
District agreement « Petite Senne »
(Cotonou, Lomé, Ouagadougou). To avoid the corruption problems the unlimited access to theft vehicle databases or to some high-level methods could be left only to European members. As a counterpart, the African members could be paid by the European Union at the same wage than European members, which could be a mean to raise the cost of corruption (it would be much more costly for the thieves to corrupt them).

- Tenth of thousands of vehicles similarly transit every year by the main corridors of Africa, enabling the theft to be once again less visible, except the fact that their vehicles are more recent. These places are similarly to the harbours or vehicle markets very important hubs for the theft vehicles and where they are moreover quite noticeable as they are recent. This is also here again a good opportunity to recover theft vehicles and to identify members of the network.

- One last possibility to limit the vehicle theft traffic, as well as to support the struggle against climate change is to tighten the legislations about the export of second-hand vehicles from Europe. Currently the only necessary elements are an identity document, a CERFA (official documents to fulfil) form and a factura justifying the purchase of the vehicle if the vehicle is exported from France. We clearly see that there is no precise requirement concerning the environmental impact of the vehicle (no pollution test, no certification of respect of the European standards, …). At the same time, these second-hand vehicles though represent a massive source of pollution for the African cities. Concerning the thefts, the documents to present are only a limited prevention against vehicle thefts since ID cards and invoices can easily be falsified, especially since invoices have no specific security enforcement contrary to official documents.

70 LOI n° 2021-1104 du 22 août 2021 portant lutte contre le dérèglement climatique et renforcement de la résilience face à ses effets.
STEP 7: PROFIT

VII Intervening against vehicle theft by limiting its outlets on the legal market.

Criminal opportunities, partners, and facilitators

Once the vehicle thieves are in possession of the vehicle and desire to sell it, they have two possibilities to dispose of it. They can sell it on the legal or on the illegal market. It seems that in the wide majority of the cases the vehicles are reinjected in the legal markets as all networks we observed made efforts to export or to disguise the vehicles. We have already seen how the exported theft had opportunities to be reinjected in legal circuits thanks to the wide exchanges in second-hand vehicles between Europa, Africa, and Eastern Europe. Combined with the low supply possibilities for some vehicle models (especially luxury vehicle models) in Africa, their profits are guaranteed by the very limited possibilities of supply that enables them to sell the vehicles for prices usually quite similar to their prices in Europe. Their profits are also nearby insured in this situation, and we already thought about logistical barriers susceptible to limit these exportation possibilities.

We will also rather focus on the vehicle remaining on the French territory after the theft. In such cases, there are too many risks for them to keep the vehicle unchanged and undisguised. We cannot study the illegal demand statistically since no survey can be led on this theme. But after the work of the in charge of the make-up of the vehicle they must still find means to sell it. There are probably tenth of thousands of such thefts vehicles that must be sold by the thieves every year, they also need to have important networks to sell so numerous vehicles. Here again, the existence of fences seems necessary to the profits of the criminal networks. But it is not the only opportunity, since the vehicles can be sold to individuals unable to identify that the vehicle has been stolen. There already exists a website enabling to verify the historic of a vehicle in France, but its use diminishes when the vehicle is correctly disguised, and most consumers do not verify the origin of their vehicle. During all the interviews we did, the interviewees considered that there is a growing problem with the new authorizations recently owned by the garage owners. The one that seems to be the most problematic under their eyes is the authorization to give number plates for vehicles (SIV authorization) that has been recently delivered to all garage owners in France. They consider this decision as very risky since many of them do not operate the necessary controls against vehicle thefts and even sometimes are accomplices with the thieves (it was indeed the case in some famous vehicle theft affairs like the case of Mantes-la-Ville where a garage’s owner sold the stolen vehicles).
The only mean we have to study this situation is to study the legal activity of the garage owners so as to consider if it can represent an actual opportunity to sell the vehicles through legal supply chains. To do so, we will try to evaluate the distribution of the garages’ profits between different activities and more interestingly the funds of the garage owners and their suppliers to identify if their modalities of financing and supply can be a criminal opportunity.

Number of employees by subsector of vehicle trade

![Pie chart showing the distribution of employees by subsector of vehicle trade.](image)

- Commerce de véhicules automobiles
- Entretien et réparation de véhicules automobiles
- Commerce d’équipements automobiles
- Commerce et réparation de motocycles

*Figure 44: Number of employees by subsector of vehicle trade.*
Auto-financing rate: ability to auto-finance of the businesses in percentage of their investments during the past year

<table>
<thead>
<tr>
<th>Category</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Commerce et réparation de motocycles</td>
<td>100</td>
</tr>
<tr>
<td>Commerce d'équipements automobiles</td>
<td>140</td>
</tr>
<tr>
<td>Entretien et réparation de véhicules automobiles</td>
<td>140</td>
</tr>
<tr>
<td>Commerce de véhicules automobiles</td>
<td>100</td>
</tr>
</tbody>
</table>

Figure 46: Auto-financing rate: ability to auto-finance of the businesses in percentage of their investments during the past year

Suppliers of the different types of vehicle-related businesses in percentage of the supplied merchandises.

<table>
<thead>
<tr>
<th>Supplier Type</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ensemble</td>
<td></td>
</tr>
<tr>
<td>Autres, France</td>
<td></td>
</tr>
<tr>
<td>Grossistes, centrales d'achats, producteurs, étranger</td>
<td></td>
</tr>
<tr>
<td>Producteurs, filiales de commercialisation, France</td>
<td></td>
</tr>
<tr>
<td>Centrales d'achats, grossistes, France</td>
<td></td>
</tr>
</tbody>
</table>

Figure 45: Suppliers of the different types of vehicle-related businesses in percentage of the supplied merchandise's
We can here observe the differences between different activities related to vehicle theft. While the businesses related to two-wheels vehicle approach the average national rate of auto-financing (89% according to the INSEE), this is very different for the activities related to vehicle theft. This is usually considered as a sign of possible higher criminal opportunities since the companies are less exposed to the control of the invest related to loans, banks. We can also notice that automobile-related businesses could be more exposed to organized crime, which is consistent with the overrepresentation of younger thieves and shorter clearance times concerning the two-wheels vehicle thieves. It could also be interesting to focus potential controls on automobile-related garages. We can finally notice that the main suppliers of the vehicle related businesses are mostly the different types of wholesalers and central purchasing organizations.

Another possibility is to dismantle the stolen vehicle. In this case, the thieves can relate on auto salvage dealers to sell the different parts of the stolen vehicles. A task force was noticeably put in place in Victoria in Australia \(^7\) which identified grave control omissions by 70% of the controlled scrap dealers. The introduction of such controls on the individuals susceptible to buy different metals could also lead to a decrease of the demand on the illegal market. It revealed severe dysfunctions in the controls against thefts put in place by the scrap dealers in Australia and the scale that this market could represent for vehicle thieves. We could object that in France, the legislation was hardened to struggle against this phenomenon. But it does not take in account the non-declared scrap dealers, who were 46% of the interrogated scrap dealers in the survey of Victoria. Among the other results of the report, 20% of the scrap dealers sold dangerous scrap parts and 92% did not verify if the vehicles were stolen or not. We did not find any evidence of the existence or not of such a task force in France or in other EU member states, but these results can let us imagine that such a task force could have very encouraging results. Moreover, it could bring

more safety for the drivers and for the environment as scrap dealers, if they don’t apply some safety processes, are susceptible to threaten the drivers and environment as well.

**Signals**

Usually, garage owners having a SIV authorizations are allowed to give new number plates to vehicles, but it is more adapted to give a temporary number plate (as for new vehicles) to a stolen vehicle. These plates are highly recognizable, as we said before, since they necessarily begin with WW. This is a useful mean to number a vehicle this way to make believe it is new, since a new vehicle is valued more and more over can logically not be stolen if it is new.

But the most important signals of profit opportunities for vehicle thieves could be the discovery of wide non-declared businesses, especially if they are scrap parts dealers. The non-declared activities escape to any kind of controls about vehicle thefts, and this is an opportunity for them to buy low-cost scrap parts coming from theft vehicles. The specificity of these illegal scrap dealers is that they remain nonetheless highly visible and also can be identified by the authorities.

**Possibilities of logistical barriers**

- Creating a task force in charge of the inspections of the scrap dealers at the level of the different member states of the European Union could be an efficient mean to reduce the outlets for scrap parts coming from stolen vehicle. This task force issued from a police organization (it seems in France to fit with the missions of the judiciary police) could inspect different scrap dealers and check their conformity to several criterions: necessary documents to exert the professions, realization of the necessary controls, absence of ecological damages. The results of such a task force in Australia are indeed very encouraging.
- Similarly, we noticed that garage owners can be inspected to check the conformity of their declarations to observed situations of different vehicles. There could be additional requirement to obtain the right for providing license plates. For instance, there could be new conditions to be allowed to give number plates for a vehicle, which are not the conditions required to be a garage owner.
- There could be exactly similar controls for the wholesalers of vehicles’ scrap parts and vehicles scrap parts. Especially since they can be in possession of scrap parts where the VIN is engraved. This could nonetheless be the less effective of the barriers since there are very numerous scrap parts of very different vehicles transiting through a storage building of a wholesaler.
- Entrust the task to struggle against automobile theft in preference to the police and gendarmerie’s forces specialized in the fight against organized crime while the two-wheels vehicle thefts could rather be entrusted to the forces specialized in the fight against individual criminality.
Dutch barrier model case study

Introduction

Situation in the Netherlands

In the Netherlands, cars, commercial vans, machinery and equipment and automotive parts are stolen in the context of organised crime. This vehicle crime is part of organised crime and crime that undermines society, which is linked to other forms of crime. For example, stolen cars are used to import items such as drugs, weapons and money (Ferwerda et al., 2013; Ferwerda & Wolsink, 2022). In addition to the use of stolen cars to transport drugs, weapons and money, cars are also stolen for financial gain. Specific models of cars are stolen on a demand-and-supply basis and transported abroad. Many of these thefts are carried out to order. This involves the theft of a specific make of car. Automotive parts are also stolen based on demand and supply. Some parts are used to carry out repairs on vehicles that are missing components. Other parts are stolen to order for financial gain (such as catalytic converters, which bring in a lot of money).

Stolen cars, often more expensive models, are also used as currency. The reason for this is that paying with cash has become more difficult. For example: a consignment of cocaine is paid for with an expensive, stolen vehicle.

The Netherlands performs a key transit function for organised car theft. Perpetrators from abroad travel to the Netherlands to then steal parts in the Netherlands, which they take back to their home country (Ferwerda et al., 2005; Ferwerda & Wolsink, 2022). In addition, the Netherlands appears to be a transit country to other countries around the world. Cars stolen in the Netherlands are transported abroad in containers and lorries (for example to Ghana).

Scope, trends, figures and statistics

Cars

There has been a decline in the theft of passenger vehicles. In 2012, more than eleven thousand passenger vehicles were stolen, however in 1995 the total exceeded 26,000 (De Miranda & Van der Mark, 2012; Ferwerda et al., 2013; Ferwerda & Wolsink, 2022). This decline continued after 2012: in 2015 the number of stolen passenger vehicles was 10,091 (Boerman et al., 2017; Ferwerda & Wolsink, 2022). Figures released by the National Intelligence and Expertise Centre for Vehicle Crime (Landelijk Intellig en Expertisecentrum Voertuigcriminaliteit, LIV) show that the decline continued until 2021. However, the year 2022 saw a slight increase (see figure 48). It is important to note that there is a ‘dark’ number. The figures only include recorded thefts, but thefts have also gone unreported. People who chose not to report the theft believe that reporting the crime does not help [them] (Centraal Bureau voor Statistiek, 2020).

Regarding insurance in case of vehicle theft. If the owner of the car wants to receive money from the insurance, a declaration of the car theft is required. Before the insurance buys off the car, there is a period in which it is checked whether the car can be found. A lump sum payment is made based on the value of the day.
In 2022, a total of 2900 passenger vehicles were stolen up to June (LIV, 2022). This is a 13% increase compared to the first six months of 2021. Passenger vehicles are differentiated by age: zero to three years inclusive and four years and over. Figure 49 shows that there was an initial increase in thefts of passenger vehicles from zero to three years old. The number of stolen passenger vehicles from zero to three years old fell in 2022. However, the figures show a rise in the number of passenger vehicles four years old and over (more specifically four to six inclusive) compared to previous years.

Figure 48: Thefts per category 2018-2022

Figure 49: Percentage of stolen passenger vehicles 0–3 and 4–6 years old
Respondents state that the cars stolen are often ‘cheaper’ cars. This is because these vehicles have fewer/little/no anti-theft devices compared to more expensive cars. Apart from an engine immobiliser, these cars have no other security requirements. Therefore ‘cheaper’ cars are easier to break into, as these cars have less protection against theft. The ‘cheaper’ cars are transported abroad. Respondents mention that the ‘cheaper’ cars are mainly transported to African countries. Respondents also state that the most sought-after car varies from period to period. Respondents state that German cars are highly sought-after in Eastern Europe, because these cars are sturdy and robust.

The LIV also keeps a record of the type and number of passenger vehicles recovered. The number of passenger vehicles recovered has remained fairly constant over the years.

The top five stolen car makes were the same in both the first half of 2021 and the first half of 2022.

<table>
<thead>
<tr>
<th>Car make</th>
<th>2021 January-June Number (decrease/increase compared to 2020)</th>
<th>2022 January-June Number (decrease/increase compared to 2021)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Volkswagen</td>
<td>445 (-34%)</td>
<td>Toyota</td>
</tr>
<tr>
<td>Toyota</td>
<td>229 (-20%)</td>
<td>Volkswagen</td>
</tr>
<tr>
<td>Renault</td>
<td>203 (-30%)</td>
<td>Peugeot</td>
</tr>
<tr>
<td>Peugeot</td>
<td>176 (+8%)</td>
<td>Renault</td>
</tr>
<tr>
<td>Audi</td>
<td>162 (-30%)</td>
<td>Audi</td>
</tr>
</tbody>
</table>
The LIV has also revealed which car models are most frequently stolen. In 2021, the Volkswagen Golf was the most commonly stolen car. In 2022 (up to June), the most commonly stolen car was the Toyota RAV4. This model has already been stolen more times in 2022 than in the whole of 2021. Figure 52 shows the most frequently stolen car models. Figure 53 shows the car models at highest risk of theft.

<table>
<thead>
<tr>
<th>Car make and model</th>
<th>Number</th>
<th>Car make and model</th>
<th>Number</th>
<th>Car make and model</th>
<th>Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Volkswagen Polo</td>
<td>170</td>
<td>Volkswagen Golf</td>
<td>328</td>
<td>Toyota RAV4</td>
<td>196</td>
</tr>
<tr>
<td>Volkswagen Golf</td>
<td>164</td>
<td>Volkswagen Polo</td>
<td>295</td>
<td>Volkswagen Golf</td>
<td>139</td>
</tr>
<tr>
<td>Fiat 500</td>
<td>83</td>
<td>Fiat 500</td>
<td>196</td>
<td>Volkswagen Polo</td>
<td>139</td>
</tr>
<tr>
<td>Mazda CX-5</td>
<td>68</td>
<td>Toyota RAV4</td>
<td>181</td>
<td>Mazda CX-5</td>
<td>92</td>
</tr>
<tr>
<td>BMW 3 Series</td>
<td>64</td>
<td>Mazda CX-5</td>
<td>147</td>
<td>Toyota Auris</td>
<td>89</td>
</tr>
<tr>
<td>Renault Megane</td>
<td>62</td>
<td>Renault Megane</td>
<td>123</td>
<td>Toyota C-HR</td>
<td>62</td>
</tr>
<tr>
<td>Nissan Qashqai</td>
<td>56</td>
<td>BMW 3 Series</td>
<td>113</td>
<td>Peugeot 3008</td>
<td>60</td>
</tr>
<tr>
<td>Toyota RAV4</td>
<td>52</td>
<td>Nissan Qashqai</td>
<td>104</td>
<td>Renault Clio</td>
<td>58</td>
</tr>
<tr>
<td>Toyota C-HR 1</td>
<td>51</td>
<td>Renault Clio</td>
<td>104</td>
<td>BMW 3 Series</td>
<td>46</td>
</tr>
<tr>
<td>Toyota Aygo</td>
<td>46</td>
<td>Toyota C-HR</td>
<td>98</td>
<td>Opel Corsa</td>
<td>45</td>
</tr>
</tbody>
</table>

Figure 52: Most frequently stolen models

<table>
<thead>
<tr>
<th>Car make and model</th>
<th>Number (percentage recovered)</th>
<th>Car make and model</th>
<th>Number (percentage recovered)</th>
<th>Car make and model</th>
<th>Number (percentage recovered)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lexus RX 450 H</td>
<td>12 (0%)</td>
<td>Toyota RAV4</td>
<td>181 (26%)</td>
<td>Toyota RAV4</td>
<td>196 (22%)</td>
</tr>
<tr>
<td>Toyota CH-R</td>
<td>51 (27%)</td>
<td>Toyota C-HR</td>
<td>98 (26%)</td>
<td>Mazda CX-5</td>
<td>92 (21%)</td>
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<tr>
<td>Mazda CX-5</td>
<td>68 (29%)</td>
<td>Mazda CX-5</td>
<td>147 (26%)</td>
<td>Toyota CH-R</td>
<td>62 (19%)</td>
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</table>

72 LIV Infographic: Theft statistics in the first six months of 2021; LIV Infographic: Theft statistics in the first six months of 2022
73 LIV Infographic: Theft statistics in the first six months of 2021; LIV Infographic: Theft statistics in 2021; LIV Infographic: Theft statistics in the first six months of 2022
LIV Infographic: Theft statistics in the first six months of 2021; LIV Infographic: Theft statistics in 2021; LIV Infographic: Theft statistics in the first six months of 2022
Figure 53: Models at highest risk of theft

The 2021 Security Monitor shows that 0.1% of all participants fell victim to car theft and 0.9% to automotive part theft (mirrors and hubcaps). Car theft has a somewhat high rate of reporting, with 80% of victims making a report (Statistics Netherlands, 2022).

### Automotive parts

There has also been a decline in the theft of automotive parts. The LIV gathered information on stolen automotive parts from the police in 2016 and 2020. More than 32,000 parts were stolen in 2016. The total in 2020 was 18,000. In 2016, Volkswagen, Audi and Mercedes-Benz were the most common makes of automotive parts stolen. In 2020, Volkswagen was still the most frequently stolen make of automotive component. Alongside Volkswagen, Toyota and BMW were the other two most commonly stolen make of automotive parts in 2020. Frequently stolen parts are navigation systems, number plates and air bags (Ferwerda & Wolsink, 2022).

One respondent stated that automotive parts are often stolen from higher end vehicles, as these are worth much more. Parts frequently stolen from higher end vehicles are steering wheels and multimedia systems (in-car navigation, telephone and entertainment system). Headlights are also stolen and catalytic converters are currently very popular.

In addition, respondents stated that a distinction can be made in the theft of automotive parts. Firstly, components are stolen because they are high value and have a ‘bling’ image. These parts can be sold quickly. Secondly, automotive parts are stolen for repairs/damage recovery. These parts replace defective components or even a stolen component.

### Locations

Specific locations in the Netherlands are attractive for vehicle crime. Border areas are popular, because offenders can cross the border relatively quickly (for example Limburg) and locations with multiple exit routes (such as Amsterdam). The types of vehicles stolen also vary from region to region.

### Modus operandi

#### Offender groups

The study by Ferwerda and Wolsink (2022) shows that the offender groups involved in vehicle crime are organised and professional. These offender groups come from both the Netherlands and abroad. The motive for stealing cars or automotive parts differs from group to group. For example, cars and parts are stolen for financial gain, but also for use in other criminal activities. Cars, and fast cars in particular, play a facilitating role because they are used to carry out ATM explosive attacks and assassinations. These are examples of High Impact Crimes (HIC).
Ferwerda and Wolsink (2022) assert that there are two types of criminal alliances. The first type they identify is a criminal alliance in which members perform multiple roles. This means that the car is not only stolen, but subsequently also stripped. The parts are then sold. The theft of the car is not the main goal for this group, however, but rather plays a facilitating role in other criminal activities. These alliances mainly involve native Dutch people who are active at both local and regional level. This group is based in part on social relationships, such as friendships and family ties. The group may also know each other because they are neighbours (for instance at a caravan site). The literature also states that the group may be based on a shared detention history or work relations. In this group, one person is the ‘leader’. This person is often also the owner of a garage, workshop or warehouse. Both legal and illegal practices take place at this location.

The second type of criminal alliance is different. It involves a cell structure in which the group is managed from abroad (often a central point). Information on target vehicles is received from abroad. This form of alliance has a professional and organised structure, in which each member plays a role. Such roles can include document fraud, knowing how to ring a vehicle, knowing how to break into a specific make of car, and knowing how to alter the chassis number. Structuring the alliance in this way enables the group to continue to function if an element is apprehended. Group members can be replaced. Before a vehicle is stolen, open sources are used to identify which cars can be stolen. Members of this offender group come from the Netherlands and the Baltic states, but also Central and Eastern Europe. Multiple ethnicities are involved in this type of alliance. A member’s ethnicity largely determines their role, as each ethnicity has specific expertise.

The literature and interviews with respondents show that offender groups specialise in a specific type of car make for which there is a market. New cars from zero to three years old that belong to the high-end segment are very attractive to offender groups. These are Audi, Volkswagen, BMW and Mercedes, higher-end four-wheel-drive passenger cars and hybrid passenger cars of various makes. When a new car is released onto the market, criminal offender groups purchase one of these new cars to examine the best way to steal them. The car is therefore completely disassembled.

Respondents state that both types of alliance exist in the Netherlands. With regard to the second alliance, respondents see a non-Dutch group of offenders who fly in via Eindhoven airport and stay in the Netherlands for a number of weeks. These offenders usually stay at holiday parks. The holiday park accommodation is properly paid for. Car thefts are carried out in an organised manner and are commissioned. Members are divided into two groups: members who steal the cars and members who subsequently transport the cars. Respondents state that this type of alliance mainly targets BMW cars. Respondents also see the other type of alliance in the Netherlands.

**Method**

The literature claims that four processes form the basis of organised car theft: acquisition, processing, brokering and purchasing (Ferwerda et al., 2005; Ferwerda & Wolsink, 2022).

Cars and parts are stolen to order. They are then quickly sent abroad or first ringed/stripped. Perpetrators specialise in the theft of a specific type of make or type of car. It is also possible to look up on the Dark Web how to steal a specific car or how to remove a specific part of a specific car.
Selecting the target

The offender group must first select the vehicles they want to steal. They do this by using Google Street View to search for locations of attractive cars. The offenders can also follow and observe a specific vehicle. Respondents reported that offenders also make circuits of a neighbourhood to identify locations of potential targets. They also attach trackers under the cars so they can track them.

One respondent also reported that delivery service employees can be hired to pay extra attention to specific types of cars during their rounds of the neighbourhood. They may be hired by an offender group or may themselves be a member of an offender group involved in the theft of cars and automotive parts. During their rounds they look out for a specific type of car and pass on the address details of the car’s location.

Breaking in via the door

The doors of the car can be opened using tools. This can be done by smashing the window with a certain type of tool or by using professional equipment that disables the alarm system and manipulates the engine immobiliser. The car electronics are then reconfigured, making it possible to start the car (using a different key).

Breaking in via the rear window

In the case of the Toyota RAV4, it is possible to push in the rear window, enabling perpetrators to enter the car and then access the car’s engine management system.

Breaking in via the headlight

Perpetrators can access the OBD system through the headlight, as the OBD system must be within easy reach. This makes it possible to access the engine management system.

Breaking in via the lock

There are several ways to break in via the lock. This can be done by reading the key (using professional equipment), but also by using a lock cylinder, turbo decoder or little Joe (lock-picking tools).

Breaking in via a wheel

Perpetrators can remove the mudguard from the wheel arch. Behind the mudguard is a connector for systems including the camera and lights (CAN bus). The perpetrators remove the connector and attach an adaptor plug in between. This enables them to communicate with the car in order to unlock and start it.

Breaking in via an application

Certain vehicles do not need a key, but instead use an application to open and start the car. It is possible to hack this application in order to open and start the car remotely.
Impact of vehicle crime in the Netherlands

The literature states that vehicle crime has a significant impact. For example, it affects the general public's sense of security. This applies in particular to the victims whose car has been stolen. Vehicle crime also results in considerable financial losses for insurers, but also for private individuals and garages.

In addition, component theft is disastrous for the legal sector since, unlike mala fide businesses, bona fide businesses cannot offer parts for an extremely low price. Moreover, the availability of stolen parts on the market affects confidence in trade. It also distorts competition.

Finally, the literature asserts that road safety is also compromised as stolen cars are also often used to produce a new car. This car is then assembled with a wreck and is glued together, so to speak. It therefore does not meet the safety requirements (Ferwerda et al., 2013; Ferwerda & Wolsink, 2022).

In addition to the above-mentioned impact of vehicle crime, respondents report that a further consequence is emotional harm to victims. On top of this, victims must arrange replacement transport in order to get to work. Passenger cars often contain items that are consequently also stolen. Moreover, victims are at risk of repeat victimisation. This means that if they have been forced to replace a part due to theft, that part may be stolen again, making them a victim of vehicle crime once again. Vehicle crime also affects environmental pollution. Workshops that install stolen parts in cars often pay no regard to environmental requirements. Garages can also be sites of labour exploitation. Finally, respondents report that stolen cars are used for other criminal activities such as the transport of weapons and drugs, but also for ATM explosive attacks.

Market (legal and illegal) (facilitators/partners, etc.)

In the Netherlands, cars and automotive components are stolen for financial gain and then sent abroad. Cars are also used for other purposes (as currency and for other criminal activities; see above). The cars and automotive parts are often stolen to order.

The stolen parts and cars are sold in the Baltic states, countries in Central and Eastern Europe and African countries. (Ferwerda & Wolsink, 2022)

Stripped parts are sold in the Netherlands, Greece, Poland and Lithuania (Ferwerda & Wolsink, 2022). Although foreign trade was initially more widespread, domestic trade in stripped parts has increased since around 2013. Parts are often reprogrammed in another location (often abroad) and then returned to the market and sold. The parts disappear on the illegal market or are offered on the internet through straw men.

Ringed cars are transported to the Antilles, Aruba, North and West African countries and Iraq. These ringed cars are sold through mala fide dealers or illegal car markets (Ferwerda & Wolsink, 2022). Many cars are also transported abroad to repair damage there. This is because repairs can be carried out at lower costs at private garages than at garage businesses in the Netherlands.
Main findings (for dissemination)

- There has been a downward trend in the theft of passenger cars and car parts, however 2022 has shown a rise in the theft of passenger cars to date.
- Various modi operandi are employed for the theft of cars and car parts.
- The literature distinguishes between two alliances. These are also mentioned by the respondents.
- Stolen vehicles are used for several purposes. In addition to financial gain, they are mainly used for other criminal activities.
- The impact of vehicle crime is multifold, ranging from repeat victimhood to interference with trade, distortion of competition and environmental crime.
- Foreign trade was initially more widespread, however domestic trade in stripped (stolen) automotive parts has increased since 2013.
- Many of the stolen automotive parts and stolen cars are transported abroad: Baltic states, Central and Eastern Europe and African countries.

Barrier Model

The Dutch barrier model focuses on car theft and theft of automotive parts by criminal groups. The barrier model is made up of eight steps: 1) Arrival in the Netherlands; 2) Stay; 3) Use of infrastructure; 4) Preparation; 5) Committing the offence; 6) Storage; 7) Transport and trade; and, finally, 8) Financial gain. The fourth step ‘preparation’ is an additional step in the barrier model. This step was added because offenders do not always strike as soon as they identify a suitable target.

Step 1: Arrival in the Netherlands

This step looks at how the criminal offender group comes to the Netherlands.

Opportunities

- Ability to travel freely through Europe
- Anonymity

Traveling by road is easy because of the open borders: there are no checkpoints or customs points like at the airport. This allows you to remain anonymous.

- No public-private data exchange

Warning signs

- Luggage does not match the type of trip
- Cash payments

Facilitators

- Airports (Rotterdam, Eindhoven, Maastricht and more)
- Airlines
- Foreign taxi firms
Barriers

- Passport control with enquiry as to destination/place of residence
- Identification of individuals (such as returning individuals from a specific country)
- Set up information exchange between public and private parties (like airports, airlines, taxi firms etc).

Partners

- Customs
- Police

STEP 2: STAY

This step focuses on the criminal offender group’s place of residence in the Netherlands. On arrival in the Netherlands, the offenders stay at a place of residence for a specific period.

Opportunities

- No night register/guest register
- Only main tenant registered at holiday park
- Possibility of staying anonymously

Warning signs

- Curtains shut during the day
- Leaving the site at specific times
- Many foreign number plates at a holiday park

Facilitators

- Holiday parks
- Lodging/accommodation providers
- Fellow countrymen who are already in the Netherlands and who help to arrange a place of residence

Barriers

- Verifiable registration of tenants and visitors
- Use of digital night register
- Raise awareness among lodging/accommodation providers

Partners

- Lodging/accommodation providers
STEP 3: INFRASTRUCTURE
This step looks at how the criminal offender group moves around the Netherlands using the infrastructure.

**Opportunities**

- Ability to travel around the Netherlands anonymously
- No toll payments in the Netherlands
- Ability to use public transport

**Warning signs**

- False number plates
- Many German rental cars
- Polish/Lithuanian carriers with light commercial vehicles

**Facilitators**

- NS/ProRail
- Straw men
- Rental companies

**Barriers**

- Better data sharing by imposing agreements where applicable between all parties
- More targeted use of ANPR at hubs
- Contact with police and investigation agencies

**Partners**

- Police
- Investigation agencies

STEP 4: PREPERATION

This step deals with the preparation deemed necessary before the offence, the theft, takes place.

**Opportunities**

- Ability to use Google Street View to identify potential targets. There is no fixed update schedule for Google Streetview in the Netherlands. But major cities are probably updated once a year.
- Ability to access public information on vehicles. Information regarding the value of the car, how many kilometres the car has driven, what technology is in the car, etc.
- The internet can be used to look up how to open a car
Warning signs

- Asking questions about a specific model of car on specific websites such as Kiwa and RDW (Netherlands Vehicle Authority). Questions regarding the working of the car and how car functions/works.
- Unfamiliar vehicles driving through the neighbourhood
- Knowledge of the modus operandi

Facilitators

- Google Street View
- Websites: car sales sites and Kiwa/RDW
- Straw men. Straw men are generally used to drive the car without being tracked down. For this step they can help in the preparation for the thefts, by for example gathering information on suitable targets.

Barriers

- More targeted use of ANPR
- Awareness among the general public
- Knowledge of the various modus operandi

Partners

- Police
- RDW/Kiwa

STEP 5: COMMIT THE CRIME

In this step, the offence takes place. This involves the theft of the whole car and theft of automotive parts.

Opportunities

- Faking number plates
- Attaching a track and trace device to the underside of the vehicle and tracking it
- Demand and supply

Warning signs

- Jammer detection
- Abnormal patterns. Certain security techniques can keep track of patterns and if the pattern is deviated from, there may be theft, for example. For example, if a fixed pattern takes place every Monday during the day (for example, traveling to work between 07:00 and 09:00 and traveling home around 18:00), but then suddenly the car is used on Monday at midnight.
  - False number plates
Facilitators

- Providers of tools and special equipment for (breaking into) cars
- Network
- Internet

Barriers

- Requirements on keys in the case of keyless entry. For example sleep mode after 3-5 seconds
- Preventive actions by the general public (for example placing keys in a case or biscuit tin)
- Ensure that parking spaces are secure

Partners

- Police
- Civilians

STEP 6: STORAGE

Once the offence has been committed, the car or automotive parts are stored somewhere before being transported and traded.

Opportunities

- Ability to store a car in a lock-up garage/warehouse
- Temporary storage of cars in containers. For transport and trade, but also before the car is taken apart for the sale of parts
- Renting lock-up garages/warehouse

Warning signs

- Longer than x number of days in a car park
- When vehicles are scrapped: car has no damage
- Scrapyards that are busier at night than during the day

Facilitators

- Lock-up garages/warehouses
- Workshops
- Lessors of lock-up garages/warehouses

Barriers

- Installation of track and trace devices in cars
Information campaigns for owners of lock-up garages/warehouses on the consequences of subletting and the consequences for them as lessor to a mala fide tenant. Tenants and owners are liable.

- Allow the police to use location data for ‘connected cars’ from the National Intelligence and Expertise Centre for Vehicle Crime (LIV)

**Partners**

- Police
- Lessors of lock-up garages and warehouses

**STEP 7: TRANSPORT AND TRADE**

This step focuses on the transport of, and trade in, the whole car and automotive parts.

**Opportunities**

- Use of roads to other countries
- Use of the port
- Customs has a lot of data but this data is not passed on to the police

**Warning signs**

- Container weight does not match reported ‘bill of load’
- Last minute need to load a car into a container
- Consignment notes with matching details (for example the same telephone number)

**Facilitators**

- Port customs
- Carriers
- Harbour master/port supervisory authority

**Barriers**

- Check whether ‘bill of load’ matches weight. Is required, but can be done more strictly.
- No further changes X number of hours prior to departure
- Continuous education on vehicle crime for the police and Royal Netherlands Military Constabulary (KMar). This can also be done through factsheets or briefings. Vehicle Theft is not a main task of the KMar.

**Partners**

- Police
- Customs
- Harbour masters
STEP 8: FINANCIAL GAININGS

The final step in the barrier model addresses what takes place after the trading of the stolen car or automotive parts.

**Opportunities**

- Demand and supply
- Fast trade
- Low chance of being caught. Unfortunately, the chance of being caught is still low in the Netherlands due to a low priority for car theft. As a result, perpetrators do not stand out or attract attention if they have sold stolen cars or automotive parts for financial gain.

**Warning signs**

- Businesses show no activity, but are active for tax purposes
- Fast-growing businesses
- Purchasing but not registering old timers/replicas

**Facilitators**

- Businesses used as a front for money laundering (for example: nail salons, chip shops, pizzerias, massage salons, hairdressers, automotive companies/dealerships)
- Leasing companies (risk of lease fraud)
- Insurers (risk of insurance fraud)

**Barriers**

- Greater insight into unaccountable assets
- ‘Suspect property’ instead of ‘unaccountable assets’. This has to do with legal terminology. With ‘suspicious possession’ you can act more and faster (with a view to criminal law) than with ‘unexplained assets’.
- Better registration AND transparency of damaged cars in the EU and the Netherlands. Also of RTL-status (rental and lease cars)

**Partners**

- The Chamber of Commerce
- Police
- Tax and Customs Administration
- RDW/LIV
## Conclusion

<table>
<thead>
<tr>
<th>Most important lessons learned (for dissemination)</th>
</tr>
</thead>
<tbody>
<tr>
<td>The situation in relation to the theft of cars and automotive parts in the Netherlands shows that such theft is part of a bigger picture. It is important to remember that cars and automotive parts are stolen not only for financial gain, but also for other purposes. In addition, car theft perpetrators are highly professional and specialised in stealing cars.</td>
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Bibliography


Capital.bg. The automotive sector in Bulgaria: the new grows, but also ages [Автосекторът в България: новото расте, но и старее]. 21 January 2022. Online at: https://www.capital.bg/biznes/transport/2022/01/20/4303850_avtosektort_v_bulgariia_novoto_raste_no_i_staree/


Francillon, Aurélien; Danev, Boris; Capkun, Srdjan (2011). Relay Attacks on Passive Keyless Entry and Start Systems in Modern Cars. ETH Library. DOI: 10.3929/ethz-a-006708714


Appendices

Belgian country report

The respondents within this project can be split up in law enforcement officers and private sector partners. The law enforcement officers are designated LEA before their respective number, the private sector respondents are designated PS before their respective number. All respondents were interviewed twice: once informally to discuss the project and their possible collaboration and once formally to conduct the official interview. The official interviews were recorded with permission of the respondents, all of them agreed to the terms and conditions. The focus group was conducted with only LEA, at their own request. Two of the five law enforcement officers attended the focus group, the other three cancelled last minute citing personal and professional obligations.

Interviews:
LEA1: SPN (Maritime and River Police- Federal)
LEA2: FPG 1
LEA3: FGP 2
LEA4: FGP 3
LEA5: Local police/ expert in vehicle identification
PS6: Baloise Insurance (private investigator)
PS7: AXA insurance (coordinator fraudulent claims)
PS8: Assuralia (legal representative)
PS9: Assuralia (Coordinator Fraud)
PS10: Vehicle Crime Investigators association
PS11: PhD student/ White hat hacker
PS12: Bpost/ Landmark Global
PS13: Car- Pass initiative
PS14: TRAXIO (mobility federation)

Focusgroup:
LEA1 and LEA4

Bulgarian country report

Respondents

<table>
<thead>
<tr>
<th>Occupation</th>
<th>Code</th>
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<tr>
<td>Head of Customs post at ‘Kapitan Andreevo’</td>
<td>CO-1</td>
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<tr>
<td>Head of sector ‘Motor vehicle theft’ at GDNP</td>
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</tr>
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<td>Sector ‘Motor vehicle theft’ at ODMVR-Varna</td>
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<td>Sector ‘Criminal police’ at ODMVR-Sofia</td>
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<td>Head of sector ‘Motor vehicle theft’ at SDRV</td>
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<td>Head of shift at ‘Kapitan Andreevo’ border crossing point</td>
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<td>Sector ‘Crimes related to motor vehicles theft’ at GDGP-Svilengrad</td>
<td>LEO-9</td>
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Head of department ‘Traffic police’ at GDNP  LEO-10
Notary  PA-1
Car dealership owner, former car thief  PA-2
Department ‘Liquidation’ at Asset Insurance company  PA-3
Director of department ‘Security’ at DZI  PA-4
Former insurance agent arrested for insurance fraud  PA-5
Chairman of Locksmith Association  PA-6

**Abbreviations**

<table>
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<th>Abbreviation</th>
<th>Description</th>
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<tr>
<td>AML</td>
<td>Anti-money laundering</td>
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<tr>
<td>ANPR</td>
<td>Automatic Number Plate Recognition</td>
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<tr>
<td>BCP</td>
<td>Border Crossing Point</td>
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<tr>
<td>CACIAF</td>
<td>Commission for combating corruption and confiscation of illegally acquired property</td>
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<tr>
<td>CRC</td>
<td>Communications Regulation Commission</td>
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<td>EMPACT</td>
<td>European Multidisciplinary Platform Against Criminal Threats</td>
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<td>ENAA</td>
<td>European Network on the Administrative Approach</td>
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<td>FIU</td>
<td>Financial Intelligence Unit</td>
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<td>General Directorate Border Police</td>
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<td>General Directorate Combating Organised Crime</td>
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<td>General Directorate National Police</td>
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<td>KYC procedures</td>
<td>Know Your Customer procedures</td>
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<td>MOCGs</td>
<td>Mobile Organised Crime Groups</td>
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<td>Motor vehicle theft</td>
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<td>National Revenue Agency</td>
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<td>SANS</td>
<td>State Agency National Security</td>
</tr>
<tr>
<td>VIN</td>
<td>Vehicle Identification Number</td>
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</table>

**German country report**

**Respondents**

**List of expert interviews**

A17A (2022) (public sector)
A22A (2022) (private sector)
A24A (2022) (public sector)
B08A (2022) (public sector)
C24A (2022) (private sector)
C24B (2022) (private sector)
D02A (2022) (public sector)