CAR THEFT IN ENGLAND AND WALES: THE HOME OFFICE CAR THEFT INDEX

George Houghton

POLICE RESEARCH GROUP
CRIME PREVENTION UNIT SERIES: PAPER NO. 33
LONDON: HOME OFFICE POLICE DEPARTMENT

Editor: Gloria Laycock
Home Office Police Research Group
50 Queen Anne's Gate
London SW1H 9AT

First published 1992

Crime Prevention Unit Papers

The Home Office Police Research Group (PRG) was formed in 1992 to carry out and manage research relevant to the work of the police service and Home Office Policy Divisions. One of the major police department divisions which acts as customer for the PRG is the Home Office Crime Prevention Unit which was formed in 1983 to promote preventative action against crime. It has a particular responsibility to disseminate information on crime prevention topics.

The object of the present series of occasional papers is to present research material in a way which should help and inform practitioners, including the police, whose work can help reduce crime.

ISBN 0-86252-712-0

Foreword

The high level of car theft in this country has been a concern for many years and the Home Office, the police, local authorities and other crime prevention organisations are now directing considerable effort into tackling this problem. Manufacturers too are beginning to respond to the challenge by constructing vehicles which are more secure.

The provision of better statistics on car theft is something that can assist in all these areas. This report outlines the procedures used in the development of the Home Office Car Theft Index which was launched by the Home Secretary in April 1991 and which reflects the theft rate experienced by vehicles during the previous year.

The report presents a number of important facts about car crime and in particular it shows conclusively that some types of vehicle are far more at risk of theft than others. This may be because they are more desirable to steal or it may indicate that these models are less secure in some way. Whatever the cause, it is helpful if everyone involved in the prevention of car crime understands as much about the nature of the problem as possible and it is here that the information presented in this report will be of assistance.

I M BURNS
Deputy Under Secretary of State
Home Office
June 1992

Acknowledgements

I am grateful to everyone who supplied data and helped with the production of this index. In particular, to Carmelo Aquilina from the Society of Motor Manufacturers and Traders for the many hours he set aside to answer our questions using his encyclopedic knowledge of vehicle classification and for his efforts in preparing data for the index; to the many staff at the Driver and Vehicle Licensing Agency who took numerous telephone calls from us and who provided enough data to keep our computers running constantly for many weeks; to all the police forces who supplied stolen vehicle data for the index; to the Association of British Insurers who allowed us to take information from their anti-fraud register; and, finally, to Ben Hargreaves who during his time on this project practically lived in the computer room for several months and who provided an enormous amount of valuable support for this work.

George Houghton
June 1992

The Authors

George Houghton is a member of the Home Office Police Research Group.

Contents

List of tables

List of figures

1 Introduction

The Car Crime Problem

The level of car crime in this country (theft of and from vehicles) has been high for many years; indeed, over the last five years it has been the most numerous category of crime in England and Wales. In 1991 it accounted for over 28% of all recorded crime (figure 1). Understandably, facts such as these have renewed calls for much more to be done to prevent car crime.

In many ways it is perhaps not surprising that theft of and from vehicles is so prevalent. Cars are very easy targets for criminals; they are usually attractive, high value items, often left in areas where they are vulnerable and with relatively little security. Against this background it is clear that there is considerable potential for preventing car crime and whereby making a significant impact on the national crime figures.

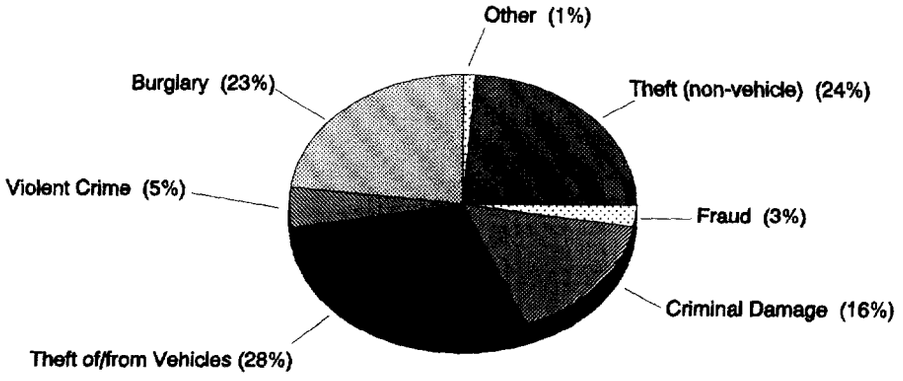
There are many ways in which this might be done. The police are working not only to detect car thieves but, together with local authorities and other organisations, to put into place measures to make areas such as car parks safer places in which to leave a vehicle. Opportunist theft by youths makes up the majority of all theft of cars and in some areas attempts have been made to divert youngsters away from these crimes (Webb & Laycock, 1992). Manufacturers have started to look again at the security measures they install as standard in vehicles acknowledging that, at present, car thieves can break into most cars with relatively little effort (WHICH, 1991). However, the public also have a role to play; too many cars are left unlocked or have inadequate security. Whilst recognising that some of the security aspects can only be addressed by the manufacturers, the Home Office is trying to make the public more aware of the need for greater care in securing their vehicles when they leave them and, where possible, to make greater use of devices such as car alarms and vehicle immobilisers.

The provision of better statistics on car theft is something that can assist all these activities. In 1988 the Car Crime Working Group (established by the Home Office Standing Conference on Crime Prevention) called for a study showing the rate at which different types of vehicles are stolen (Home Office, 1988). It was clear that some car models were more attractive than others to thieves and it was felt that the public and manufacturers should be made aware of these differences. In 1990 Ministers agreed that priority should be given to the production of such an index and work began in June of that year.

The Car Theft Index

The Car Theft Index shows the rate at which any given model of car is stolen over a one year period. It is calculated by taking a large sample of stolen vehicles in England

Figure 1. Notifiable offences recorded by the police - 1991



Source: Home Office Statistical Branch

and Wales (including theft of the vehicle and unauthorised taking but not theft from the vehicle) and determining, for each make/model of car, the numbers stolen over the period divided by the average number of cars on the road over the same period. This method of calculation allows for the fact that certain makes and models are far more numerous than others and are therefore far more likely to be stolen simply because of their greater availability to the thief.

Although this is the first time that such an index has been produced in the UK, indices of this type have been available for some years in both America and Australia (Clarke, 1990). Two American indices are currently produced, one by a U.S. Department of Transportation Agency – the National Highway Traffic Safety Administration (NHTSA) and the other by an insurance industry-supported research agency, the Highway Loss Data Institute (HLDI).

The NHTSA index is for new cars only and shows numbers of each model stolen by numbers manufactured each year. It is primarily aimed at fulfilling a 1984 U.S. Law Enforcement Act by identifying cars which are at high risk of theft. The Act obliged manufacturers of "high risk" vehicles to stamp a vehicle identification number on each of the major components of the car in an attempt to reduce theft for re-sale of component parts.

The HLDI index is compiled from insurance claim returns and identifies those vehicles which have a high claim rate per number insured. Claims for both theft of and theft from the vehicle are combined and used in the index. This is published annually by the HLDI to inform the insurance industry, manufacturers and the public of the theft record of car models.

A similar index is produced by the Australian motoring and insurance organisation – the National Roads and Motorists' Association (NRMA). This relates to New South Wales only and provides information on claims per 1000 policies per model, again for theft of and from the vehicle combined.

There are several potential benefits to be gained from the production of a car theft index –

– it provides information to existing car owners of the potential risk;

– it alerts purchasers of new cars of the risks attached to each model;

– it informs manufacturers of the relative risks of their models and, if the index is produced on a regular basis, allows them to monitor the success or failure of crime prevention measures over the years;

– if the right data are available it can also assist research into car theft.

Interpretation of the Index

The position of any vehicle in the index will be determined by a combination of the following:

– its vulnerability to thieves (i.e. how secure the vehicle is);

– its attractiveness to thieves (i.e. whether the model is desirable for spare parts, re-sale, so-called joy-riding etc);

– the behaviour of the drivers and in particular their parking habits (do they park the car in a garage overnight? Do they park in a high risk area? Do they lock the doors when they leave the car?).

The car theft index outlined in this report has not attempted to distinguish between the various underlying causes of a vehicle's susceptibility to theft. It is known from interviews with car thieves (Smyth, 1990) and surveys undertaken on car security (WHICH, 1991) that most models on the road at present are easy or very easy to break into and on this basis it is not expected that the overall security of a model will be the deciding factor in determining its position in the index. As the security of new models is improved this aspect of a vehicle's susceptibility to theft should become more influential in determining its position in any future index.

Although information on theft from the vehicle was collected, it was eventually decided not to include this in the car theft index. This was for several reasons. First, it is known that theft from the vehicle is under-reported with only about 40% of all offences reported to the police. This is in comparison to theft of the vehicle which, for

insurance purposes, is reported in 95% of cases (British Crime Survey – Mayhew, et al 1988). It was thought unlikely that this under-reporting of theft from the vehicle would be uniform across different types of model; this would in turn introduce him into any model specific index. A further reason for excluding theft from vehicle information was that, to a great extent, it was felt that the two crimes were different and should be treated separately. In the case of theft of the vehicle attractiveness of the car is obviously very significant; however, theft from the vehicle tends to be an opportunistic crime relying more on the perceived value of the goods inside rather than on the attractiveness of the specific model.

Structure of the Report

The remainder of this report examines the sources of data used in the index and the problems associated with these (section 2). It outlines the methodology eventually adopted to construct the index and explains some of the issues involved in the classification of vehicle types (section 3). The final section comments on the results obtained from the index and the benefits that might be gained from its production on a regular basis.

2 Review Of Data Sources For The Car Theft Index

Main Data Requirements

Two main types of data are required for the production of this index:

– the average number of vehicles of each type on the road over a specified period – the "vehicle park"; and

– the numbers of each vehicle type stolen over the same period – the stolen vehicle information.

For the purposes of this report the term "vehicle" refers to motor cars only (excluding light vans, HGV's, plant/machinery, buses/coaches and motorcycles).

Vehicle Park Information

The vehicle park is a statistic showing the number of vehicles registered as 'on the road' broken down by vehicle category. The key element in this is the choice and level of category used to sub-divide the vehicle population. If the classification system is too coarse then detailed model-specific differences in car theft will be lost. However, if the grouping of car types is too fine then the numbers of cars stolen within each category may be too few to provide statistically reliable or meaningful patterns. There is also the problem of grouping together models which may appear similar but in fact have very different security features. A more detailed explanation of vehicle classification and the groupings chosen for this index are presented in section three. There are two main sources of vehicle park information.

i. The Driver and Vehicle Licensing Agency

The Driver and Vehicle Licensing Agency (DVLA) at Swansea is the main potential source for vehicle park information. It holds details of all registered vehicles in the UK (excluding N.Ireland, the Channel Islands and the Isle of Man). The information held at Swansea is in the form of one record for each of the 30 million vehicles (a proportion of which will not have renewed their licences within the last year or more and as such can not be reliably included in any vehicle park statistic). As part of each record the DVLA system includes information on the make of vehicle and the detailed model. This produces a classification system composed of around 10,000 categories – far too detailed for the production of a reliable car theft index.

A further problem with the DVLA classification system is that within any make of vehicle there is no logical basis on which the various models can be grouped together. For example, there are over 130 different types of Vauxhall Cavalier, each represented by a different numerical code. These Cavalier codes are

interspersed with codes from other models. This makes it very difficult to devise a computer-based system to re-group these cars into a fewer number of more meaningful categories.

A final problem with utilising the DVLA data was that this would have involved the detailed manipulation of some 30 million records – a process to be avoided unless large amounts of fast computer time are available.

The Police National Computer also holds a copy of the DVLA vehicle park information but this suffers from much the same problems as the DVLA data.

ii. The Society of Motor Manufacturers and Traders

Because of the problems identified with the DVLA data an alternative source of vehicle park information was sought. Fortunately, a solution was found with the data held by the Society of Motor Manufacturers and Traders (SMMT). The SMMT maintain a database on new and existing vehicle registrations for use by the motor industry. The information on vehicle park is again derived from DVLA data but is processed, first, to reduce the number of inconsistencies and coding errors introduced at the DVLA and, secondly, to re-classify the data into fewer and more meaningful categories. The eventual classification system produced by the SMMT is based on around 4,500 categories but more importantly provides a coding structure which in many cases enables these categories to be combined together to further refine the classification system.

A further advantage of the SMMT option was that summary figures in computer format were already available for each SMMT category showing, for each vehicle type, the numbers of vehicles registered on the road for each year of manufacture from 1976 to 1989. The main drawback with the SMMT information was that it was only available for part of the period required. The stolen vehicle information was to cover the period from 1st November 1989 to 31st October 1990. However, the most recent SMMT census available at the time only covered the period up to 31 December 1989. In order to update this census it was necessary to supplement it with data derived from the DVLA showing the number of vehicles scrapped/exported and those newly registered up to the end of October 1990. Although manipulating the 2 million or so records involved was time consuming, this was still a considerable improvement, in terms of time savings and accuracy, over building a completely new census from DVLA data.

Stolen Vehicle Information

The problems in obtaining counts of vehicles stolen by make/model were every bit as complex as obtaining the vehicle park information. Again there were several potential sources of data for this, each with their own particular problems. It was eventually decided that the only accurate way of obtaining the necessary data would be to collect

it from police forces; the information obtainable from this and other sources of stolen vehicle data is described below:

i. The Police National Computer

The PNC maintain a database of all stolen vehicles. Unfortunately, once the vehicle is recovered the detailed record of the stolen vehicle is deleted from the PNC system. Apart from broad summary statistics, the only information PNC can provide is a "snapshot" of the current database of unrecovered vehicles at any moment in time. This contains a mixture of vehicles which have just been stolen and those which were stolen up to 5 years ago (the record is deleted after 5 years if the vehicle is not recovered). It is likely, therefore that the database under-represents those vehicles recovered quickly. It is possible that those vehicles recovered quickly (i.e. those taken by youths and abandoned) may be of a different type than those recovered over a longer period, or those that are never recovered (i.e. cars stolen by professional thieves). Because of this it was decided that the PNC information could not be used for the index.

ii. Stolen artcle information held by the DVLA

The DVLA maintain a record of whether or not a vehicle has ever been stolen / rcorded and the dates of these. This is recorded permanently against the information held for each of the 30 million or so vehicles in their database. Unfortunately, the stolen vehicle data is derived from the PNC database and suffers to some extent from the same bias as that system. When a vehicle is stolen its details are quickly entered onto the PNC; in the hope that it may be recovered. At a later date the crime report is completed and the vehicle is confirmed as stolen. Only "confirmed" vehicle thefts are passed to DVLA. If the vehicle is recovered quickly the administrative process of confirming a vehicle as stolen may not be quick enough and the stolen vehicle record may be deleted from the PNC before it is passed to the DVLA. Despite this deficiency the DVLA database is one of the few national sources of detailed stolen vehicle information in this country at present. Because of the bias away from vehicles recovered quickly, the DVLA data was not used to produce this index and could only be used for comparison with the police force data. In the long term enhancement of the PNC system to retain details of stolen vehicles after the vehicle is recovered may be the only way in which a truly national stolen vehicle index can be built up.

iii. Association of *British Insurers (ABI)*

The ABI collect theft information from all their associate insurance companies and collate this into a computer-basd, anti-fraud register. The main drawback with this information is that, once again, vehicles recovered quickly may not be reported to the insurance company as missing, leading to a potential bias in the

type of vehicle recorded as stolen. Because of this the ABI data were used only as a comparison to the information gained from police forces.

iv. Selected Police forces

Police forces throughout the country vary in the amount of detail they collect on crime and the degree to which this is available in computer format. A survey of forces was undertaken to determine which forces might contribute data to the index. Eventually 16 of the 43 forces in England and Wales were able to provide information. In total, details of nearly 109,000 car thefts were collected; this represented approximately 23% of the national theft of vehicle figures for the period and came from a wide range of different police forces (geographically and urban/rural, etc). A considerable number of these thefts were of vehicles other than motor cars, particularly motorbikes and vans. These were screened out leaving details of just over 70,000 motor car thefts. A list of those forces supplying data is shown in appendix A.

Procedures for Collecting Data

Data were collected from police forces; the DVLA; the SMMT; and the ABI. Data from police forces proved to be the most difficult to obtain of the 19 forces which agreed to supply the data, 3 eventually were not able to do so for technical reasons. The 16 remaining forces provided data in a variety of computer media which were converted for storage and analysis on a Home Office machine. Some forces could only supply data in computer print-out form which had to be recentered using data processing staff. The sample of police stolen vehicle information was collected for a 1 year period between 1 November 1989 and 31 October 1990. These dates were determined largely by the time constraints of the project.

The data from the DVLA was provided on a series of 20 magnetic tapes. These were read, converted and screened on local machines to provide the necessary data for this work.

The data from the ABI was also provided on magnetic tape and was converted in a similar manner.

The SMMT provided their 1989 census data and make/model conversion tables in computer format. This was combined into the database and computer routines were written to analyse the data and to link it to the DVLA database.

3 Construction Of The Car Theft Index

Processing the Information

It was essential that the classification system used for the vehicle park data should relate exactly to that used for vehicle theft. Since the classification of vehicles can he quite involved it was decided that the individual classification schemes used by different organisations (the police, the PNC, insurance companies, etc) could not be relied upon. A decision was taken that all information would be re-classified using the vehicle registration number (VRN). The data obtained from the DVLA made it possible to convert any VRN into an exact DVLA make / model code. This provided a common basis for vehicle classification across the various sources of data and enabled different sources of data to be cross-checked against each other. Under this system the basic requirement for data on stolen vehicles was simply a VRN for every vehicle stolen within the period in question (1 November 1989 to 31 October 1990). This data was collated from police forces, the ABI and from the DVLA system. Details of the steps involved in processing this data are given in appendix B.

Figures for numbers of vehicles on the road by vehicle category were obtained from the 1989 SMMT census. This was updated with data from the DVLA on numbers of vehicles newly registered or scrapped / exported in the last year. This enabled the SMMT census to cover the same period as that for the stolen vehicle information. Details of this process are included in appendix B. The final, updated SMMT census provided figures for the average number of each vehicle type on the road over the sample period.

Producing the Car Theft Indices

Each of the car theft indices were formed by dividing the numbers of vehicles stolen within each vehicle category by the average number of vehicles of that category on the road over the same period. This was a simple ratio which made allowance for the fact that certain makes / models of vehicle are far more numerous than others and will, all other things been equal, be more likely to be stolen. A high ratio indicates a high theft rate and vice-versa.

Because the theft information was based on a sample of car theft data, each of these ratios had associated with them a sampling error (i.e. the ratio might have been slightly different had a different sample of data been taken). This sampling error, combined with the closeness of many of the ratios – particularly for vehicles with a low theft rate - meant that there was an overlap between the theft rates of many of the vehicles and it was not possible, therefore, to produce a simple ranked list of vehicle categories. Instead, it was decided that the vehicle categories would be divided into a small number of “risk groups” (high, medium and low risk of theft). The decision on how the ratios were to be divided between these groups was taken following graphical analysis of the data to show how the theft ratios were distributed. The dividing line

between these risk groups was drawn with reference to both the average theft rate of all vehicles and the need to minimise movement between risk groups because of sampling error. More details of this process together with an example of the type of graph used are shown in appendix B (figure 9).

Vehicle Categorisation

The vehicle categorisation system adopted by the SMMT breaks vehicles into, first, make (i.e. the manufacturer – Volkswagen, Ford, Vauxhall, etc), and then into models (i.e. Ford Escort, Vauxhall Cavalier, Volkswagen Golf). However, the models themselves are an extremely diverse group with a wide variety of features and ages within any one model. Most models naturally divide into what are known as model ranges. In most cases, although not all, the range is given a mark number, for example, Escort Mk2, Cavalier Mk3 or Golf Mk2 (figure 2). These ranges often, although again not always, correspond to major re-launches of a model and in some cases this may roughly correspond to the introduction of more advanced security features. An initial index was constructed using model range as the basis for the vehicle category. The results from this are discussed in section 4 and presented in table 1 for the top 50 ranges in the UK.

Figure 2. Outline of the SMMT classification system for motor vehicles

MAKE *(Approx. 70 Makes)*	*Ford*	*Vauxhall*	*Volkswagen*
MODEL *(Approx. 290 Models)*	*Escort*	*Cavalier*	*Golf*
RANGE *(Approx. 350 Ranges)*	*Escort Mk1* *Escort Mk2* *Escort Mk3* *Escort Mk4*	*Cavalier Mk1* *Cavalier Mk2* *Cavalier Mk3*	*Golf Mk1* *Golf Mk2*
LINE *(Approx. 4,500 Lines)*	*1987 1392cc Ford Escort GL Plus Mk3* *1984 1608cc Ford Escort GL Diesel Mk3* *1981 1598cc Vauxhall Cavalier L Mk2* *1989 1796cc Vauxhall Cavalier GL Mk3* *1979 1093cc Volkswagen Golf GL Mk1* *1976 1499cc Volkswagen Golf GLS Mk1*		

The main drawback with using the model range is that there is still a diversity of vehicle types (or vehicle lines, as they are known) within any one range. For example, there are over 100 different lines of Escort Mk3. The variation within a model range includes year of manufacture, trim level, cubic capacity and performance (the two are not always related), door plan (2, 3, 4, 5 doors) and, in some cases, security features. All of these might influence a vehicle's susceptibility to theft. Despite this diversity, the model range is easily identifiable within the classification system and was one of the basic units used for production of the car theft index.

The model line resolves most, if not all, of these difficulties. Each model line is a fairly specific definition of a type of model (e.g Ford Escort GLX Mk4, 1990, 1753cc, Diesel, etc). Unfortunately there are far too many model lines (over 4,500) for these to be used as a realistic basis for construction of an index. Were model line to be used there would be too few stolen cars per line to give a reliable indication of theft rate. What was required, therefore, was something in-between the model range and model lines.

The answer to this problem came from detailed examination of the theft rate of the 50 top volume models in the UK which, between them, represented nearly two thirds of the vehicles on the road. These were grouped according to the factors available from the data which might be expected to influence theft. These were – age, door plan, trim level and performance. The last two of these were not present in the SMMT database and had to be added by painstakingly going through all the model lines in the top 50 ranges and classifying them as higher or normal performance and trim. These were subjective assessments made on the basis of detailed advice from the Society of Manufacturers and Traders and by reference to made magazines. The objective of doing this was to split up each range into more homogenous groupings or "sub-ranges". Because of this, more attention was paid to the differences within a range rather than trying to ensure a common standard of performance or trim across ranges. Some of the higher performance cars in one range did not necessarily compare to those classified as higher performance in another range. The emphasis was on separating out the higher performance cars within a range rather than relying solely on what the industry regarded as high performance. Once this classification system had been tested, additional ranges outside of the top 50 were also classified in this way.

Examination of the theft rates of different groupings of vehicle (e.g. all high performance cars, all 2 door cars, all high trim cars, etc) revealed that the most important factors in car theft were: first, performance which was by far the most important factor – if you owned what was considered to be a performance car you were many more times likely to have it stolen; secondly, age – older cars were generally more likely to be stolen than newer cars (although this did vary somewhat depending on which particular age groups were used in the comparison – figures 6/7), and thirdly, whether the car was an estate or not – although number of passenger doors was not so significant it was found that estate cars were far less likely to be stolen than non-estate versions of the same model.

These three factors - performance, age and whether the model was an estate were used to divide each model range and produce “sub-ranges” for the top 50 volume ranges. A separate index was produced from these sub-ranges – this is described in section 4 and presented in table 2.

Examining Improvements in Car Security

Over the years several manufacturers had reportedly made improvements to the security of popular models, such as the Vauxhall Cavalier Mark 3. In order to see if these improvements had affected car crime to any extent, the SMMT invited a number of leading manufacturers of volume cars to provide details of those specific ranges for which security had been improved and the extent of the security improvements. Details of four popular model ranges were supplied, these were: Vauxhall Cavalier Mk3 (1988 onwards), Vauxhall Carlton Mk2 (1986 onwards), Ford Escort Mk3 (1986 onwards) and Ford Fiesta Mk3 (1989 onwards).

In order to test if the supposed improvements in security had made any difference to car theft, each of the four model ranges with improved security was compared to its older counterpart without the improvement in security. The number of vehicles stolen during the sample period was calculated both for the version with and for the version without security improvements. In order to overcome the problem of pre-security versions often being far more numerous than their post-security equivalents, the number of each type of vehicle on the road (pre and post introduction of security measures) was calculated and the stolen vehicle figures were represented as a proportion of the number on the road.

The final adjustment made was to allow for the fact that in some cases car theft was less common in newer models (in other words a drop in car theft would be expected in more recent models regardless of any improvement in security, see figures 6/7). To make this adjustment the change in theft rate between the more secure and less secure versions of each model was compared to the average change in theft rate for all models between the periods in question. For example, the Escort Mk3 introduced security improvements in 1986. The Mk3 cars post-1986 (1986 to 1990) were compared with the Mk3 cars pre-1986 (1980 to 1985) and the theft rate of each type was calculated. This was then compared with the theft rate of all cars for the two periods (1980 to 1985 and 1986 to 1990). The results of this are shown in section 4.

Vehicle Age and Car Theft

The relationship between car theft and age of stolen vehicles was examined (for all vehicle categories combined). The number of vehicles stolen over the sample period of each age group was obtained from the vehicle registration number of the stolen vehicle records collected from police forces. The prefix or suffix of these proved to be

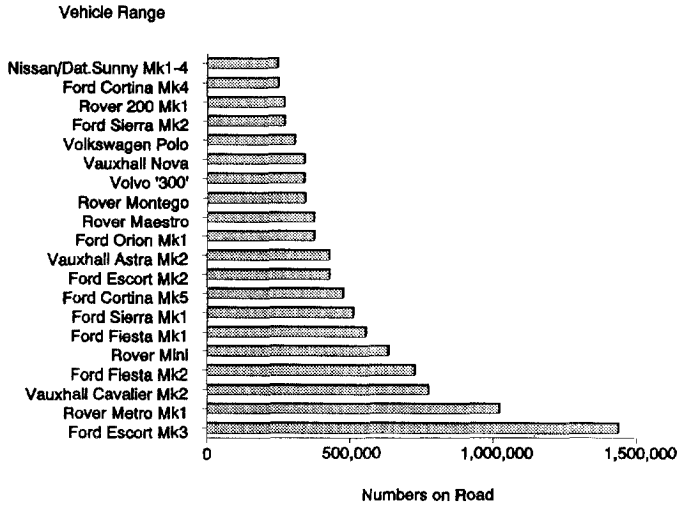
the most accurate measure of the age of the vehicle. To provide an indication of the proportion of vehicles stolen from each age group, data was obtained from the SMMT census on the number of vehicles on the road over the sample period which were 1, 2, 3, etc years old. This covered dates of registration from 1976 to 1989. Unfortunately, whilst the registration numbers were based on an August to July year (new registration letters being issued on the 1st of August each year), the figures for numbers on the road were based on a January to December year (corresponding to the SMMT census periods). To overcome this disparity a correction was applied to the number of cars on the road. The rate of increase in number of cars on the road from year to year was calculated. This was then used to adjust the SMMT census figures so they corresponded to the same August to July period as those for car theft. Again, the results of this exercise are discussed in the next section.

4 Results and Commentary

Vehicle Park Figures

The distribution of vehicle models in this country is worth examining in its own right. Figure 3 shows the number of cars on the road over the sample period for each of the top 50 volume ranges. The most striking thing is the enormous difference in population between the leading range, Ford Escort Mk3 (1,567,000 cars), and the next placed range, the Austin Metro (980,000 cars). Ford Escort as a model (Mk 1/2/3) makes up approximately 10% of the car population in England and Wales; it is of little surprise, therefore, that more of these cars are stolen than any other.

Figure 3. Vehicle park figures - top 20 ranges in use at the end of 1989



Source: Society of Motor Manufacturers and Traders

Overall, the car population is noticeably biased towards a select few model ranges. Over 20% of thr cars on the road in England and Wales are drawn from the top 5 ranges, whilst the top 10 ranges makeup nearly one third of all cars on the road. Many of these top volume ranges tend to be relatively old and are no longer in production; they will, over the coming years, become less significant both in terms of car population and car crime.

The Model Range Index

Table 1 shows the car theft index produced by using the car model range as the basic unit for classification. This is shown for the top 50 volume ranges (i.e. the most

numerous ranges on the road over the period). The index covering all ranges is shown in appendix C. The index in table 1 is divided into high, medium and low risk of theft. On average 6% of the cars in the high risk band are stolen each year. The medium risk band covers the proportions between 1% and 4%, with an average of just over 2% stolen (the national average of all cars), less than 1% of low risk cars are stolen (average 0.7%).

The most obvious fact from this table is that most of the ranges stolen are relatively old. The notable exception to this are cars like the Vauxhall Astra which are much favoured by so-called "joy-riders". Many of the other ranges are no longer in production. There are a number of possible reasons why older cars are at relatively high risk of theft:

– first, many of the older cars will belong to the poorer sections of the population and may be parked in relatively high theft risk areas;

– secondly, older cars are often less well looked after, it is often not worth the owner's while to fit security add-ons, and many will not be garaged over-night;

– thirdly, the factory installed security of many older cars is particularly poor and many are therefore notoriously easy to break into and drive away;

– fourthly, this type of car may often be stolen for spare parts, either because the spares are difficult to obtain or expensive to buy;

– finally, many older cars can be readily passed off as "write-offs", taken to a vehicle crusher and sold for the scrap value. In most cases, little or no documentary proof of ownership is asked for. Car thieves in inner city areas often prey on this type of vehicle. An alternative on the same theme is where the owner sells the car to the vehicle crusher, reports it as stolen to the police and then claims the insurance money.

The relatively high risk of theft to older cars partly explains why Ford vehicles dominate the top of the theft index. Ford's dominance of the car market over the last 15 years or more has meant that it now has a large number of older vehicles which are particularly susceptible to theft. Examination of the high risk category in table 1 shows that many of these models were produced in the late 70's/early 80's. These are now the 3rd/4th hand cars of today conforming to many of the risk factors described above.

Of those models at the top of the index two are particularly at risk. These are the Ford Escort Mk2 and the Ford Cortina Mk4. It is interesting to note that the Escort Mk2 has less than one third of the cars on the road than its newer, Mk3 equivalent; however, nearly as many Mk2s are stolen as Mk3s. The Escort Mk3 is in fact much less at risk with about 3%) of Mk3 Escorts being stolen, which puts it well within the medium risk band. The Mk3s position as the most frequently stolen car in England

Table 1. Theft risks for the top 50 volume car ranges

HIGH RISK	
FORD CAPRI MK3	FORD FIESTA MK1
FORD CORTINA MK4	FORD GRANADA MK2/3
FORD CORTINA MK5	VAUXHALL ASTRA MK2
FORD ESCORT MK2	
MEDIUM RISK	
BMW 300 SERIES	ROVER METRO
FORD ESCORT MK3	ROVER MINI
FORD FIESTA MK2	ROVER MONTEGO
FORD GRANADA MK4	VAUXHALL ASTRA MK1
FORD ORION MK1	VAUXHALL CAVALIER MK1
FORD SIERRA MK1	VAUXHALL CAVALIER MK2
FORD SIERRA MK2	VAUXHALL NOVA
FORD SIERRA SAPPHIRE	VOLKSWAGEN GOLF MK1
ROVER MAESTRO	VOLKSWAGEN GOLF MK2
LOW RISK	
AUSTIN ALLEGRO MK 1/2	RENAULT 5 MK1
CITROEN BX	RENAULT 5 MK2
FIAT UNO MK2	ROVER 200 MK1
HONDA ACCORD	TALBOT HORIZON
MERCEDES COMPACTS	TOYOTA COROLLA
MORRIS MARINA	VAUXHALL CARLTON
NISSAN/DATSUN BLUEBIRD MK2	VAUXHALL CAVALIER MK3
NISSAN/DATSUN CHERRY	VAUXHALL CHEVETTE
NISSAN/DATSUN MICRA	VOLKSWAGEN POLO
NISSAN/DATSUN SUNNY MK 1-4	VOLVO “200”
NISSAN/DATSUN SUNNY MK5	VOLVO “300”
PEUGEOT 205	VOLVO “700”
PEUGEOT 309	

Note for all tables:

(i) Rover Mini, Maestro, Metro and Montego include the Austin/Morris varieties of these models.

(ii) Risk bands are calculated as numbers stolen per number on the road

and Wales is largely due to the fact that it is by far the most *numerous* car in England and Wales.

One final point, which is obvious from only a cursory glance at table 1, is that the majority of car ranges are below average risk of theft. In other words thieves tend to concentrate on a relatively small number of popular ranges which are stolen in large numbers.

The Model Sub-Range Index

The model range, although relatively easy to define, can be rather diverse. Within each range there can be a variety of different types of cars with different characteristics influencing their chances of being stolen. As discussed in section 3, three of these characteristics were used to subdivide each range and to produce more homogenous "sub-ranges". These three characteristics were: performance (higher or average performance), age (pre and post 1988) and whether or not the car was an estate version. Table 2 shows the car theft index based on these sub-ranges.

This index has been divided into 4 categories (as opposed to the three categories in the range index), reflecting the particular susceptibility to theft of the vehicles identified by this sub-categorisation. The very high risk category represents those sub-ranges with a theft rate of 12% or higher per annum. The high risk represents theft rates of between 4% and 12%, the medium risk of 1% to 4%, whilst vehicles in the low risk category have a less than 1% change of being stolen.

The most dramatic observation from this table is that performance is very much a determining fact or where car crime is concerned. All the cars in the very high risk range and the majority of the high risk cars, were in the higher performance category. The low risk category had very few higher performance cars. This result is very much in keeping with that obtained by the insurance industry both in this country, in America (HLDI, 1990) and in Australia (NRMA 1990). In Australia sports cars were found to be by far the highest risk for theft of the vehicle whilst luxury cars had the highest incidence of insurance claims for theft from the vehicle. In the USA sports models, which accounted for less than 14% of the car insurance market, represented nearly one quarter of the theft claims and 38 percent of the financial settlements on car insurance.

The message to manufacturers from all of this is clear; the security features built into higher performance versions of each range need to be far more stringent. This is not unreasonable since the small, additional cost of improved security would be relatively insignificant when compared to the greater overall cost of higher performance cars.

The effect of performance tends to overshadow the influence on crime rates of any other of the vehicles characteristics. It is clear that all of the estate versions of a

Table 2. Theft risk for the top 50 volume car ranges split by age/performance/estate

*Denotes the Higher Performance End of Each Range

VERY HIGH RISK	
Pre-1988 Versions	1988-1990 Versions
*FORD ESCORT MK2	*FORD SIERRA MK2
*FORD SIERRA MK1	*FORD SIERRA SAPPHIRE
*FORD SIERRA MK2	*VAUXHALL ASTRA MK2
*VAUXHALL ASTRA MK2	

HIGH RISK	
Pre-1988 Versions	1988-1990 Versions
*FIAT UNO MK2	*FORD ESCORT MK3
*FORD CAPRI MK3	*ROVER METRO
FORD CAPRI MK3	*ROVER MONTEGO
FORD CORTINA MK4	VAUXHALL ASTRA MK2
FORD CORTINA MK5	VAUXHALL ASTRA MK2 (Estate)
FORD ESCORT MK2	*VAUXHALL NOVA
*FORD ESCORT MK3	
FORD FIESTA MK1	
*FORD FIESTA MK1	
*FORD FIESTA MK2	
FORD GRANADA MK2/3	
*FORD ORION MK1	
*RENAULT 5 MK2	
*ROVER MAESTRO	
*ROVER MONTEGO	
*VAUXHALL ASTRA MK1	
*VAUXHALL CAVALIER MK2	
*VOLKSWAGEN GOLF MK2	

MEDIUM RISK

Pre-1988 Versions

BMW 300 SERIES
*BMW 300 SERIES
FORD ESCORT MK3
FORD ESCORT MK3 (Estate)
FORD FIESTA MK2
FORD GRANADA MK4
FORD ORION MK1
FORD SIERRA MK1
FORD SIERRA MK2
FORD SIERRA SAPPHIRE
*NISSAN/DATSUN BLUEBIRD MK2
*NISSAN/DATSUN CHERRY
*PEUGEOT 205
*PEUGEOT 309
*RENAULT 5 MK1
ROVER MAESTRO
*ROVER METRO
ROVER METRO
*ROVER MINI
ROVER MINI
ROVER MONTEGO
*TOYOTA COROLLA
VAUXHALL ASTRA MK1
VAUXHALL ASTRA MK1 (Estate)
VAUXHALL ASTRA MK2
*VAUXHALL CAVALIER MK1
VAUXHALL CAVALIER MK1
VAUXHALL CAVALIER MK2
VAUXHALL NOVA
*VOLKSWAGEN GOLF MK1
VOLKSWAGEN GOLF MK1

1988-1990 Versions

FORD FIESTA MK2
FORD GRANADA MK4
FORD ORION MK1
FORD SIERRA MK2
FORD SIERRA MK2 (Estate)
FORD SIERRA SAPPHIRE
*PEUGEOT 309
ROVER MAESTRO
ROVER METRO
ROVER MONTEGO
ROVER MONTEGO (ESTATE)
ROVER 200 MK1
*VAUXHALL CAVALIER MK3
VAUXHALL NOVA

LOW RISK

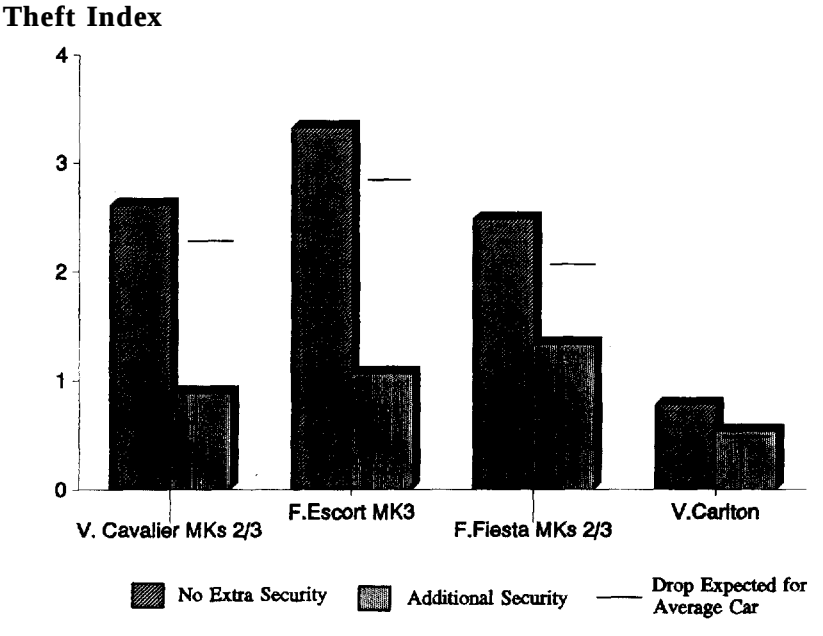
Pre-1988 Versions	1988-1990 Versions
AUSTIN ALLEGRO MK1/2	*BMW 300 SERIES
CITROEN BX	*BMW 300 SERIES (Estate)
*CITROEN BX	CITROEN BX
CITROEN BX (Estate)	FIAT UNO MK2
FIAT UNO MK2	FORD ESCORT MK3
HONDA ACCORD	HONDA ACCORD
MERCEDES COMPACTS	MERCEDES COMPACTS
MERCEDES COMPACTS (Estate)	NISSAN/DATSUN BLUEBIRD MK2
MORRIS MARINA	NISSAN/DAT. BLUEBIRD MK2 (Est.)
NISSAN/DATSUN BLUEBIRD MK2	NISSAN/DATSUN MICRA
NISSAN/DAT. SUNNY MK 1-4 (Est.)	NISSAN/DATSUN SUNNY MK5
NISSAN/DATSUN CHERRY	PEUGEOT 205
NISSAN/DATSUN MICRA	PEUGEOT 309
NISSAN/DATSUN SUNNY MK 1-4	RENAULT 5 MK2
NISSAN/DATSUN SUNNY MK5	*ROVER 200 MK1
PEUGEOT 205	ROVER MINI
PEUGEOT 309	VAUXHALL CARLTON
RENAULT 5 MK1	VAUXHALL CAVALIER MK3
RENAULT 5 MK2	VOLKSWAGEN GOLF MK2
*ROVER 200 MK1	VOLKSWAGEN POLO
ROVER 200 MK1	VOLVO “200”
TALBOT HORIZON	VOLVO “300”
TOYOTA COROLLA	VOLVO “700”
TOYOTA COROLLA (Estate)	VOLVO “700” (ESTATE)
VAUXHALL CARLTON	
VAUXHALL CHEVETTE	
VOLKSWAGEN GOLF MK2	
VOLKSWAGEN POLO	
VOLVO “200”	
VOLVO “200” (Estate)	
VOLVO “300”	
*VOLVO “700”	
VOLVO “700”	
VOLVO “700” (Estate)	

vehicle are much less likely to be stolen than their non-estate counter-parts. This may be because estate cars are often more bulky and look less "sporty" than the rest of the range. They may therefore be less attractive to thieves (i.e. the reverse of the performance car effect). Studies based on the USA insurance industry data (HLDI, 1990 and Clarke 1991) show a similar result for Station Wagons which are often owned by middle age families and seen by young thieves as less exciting to steal.

Car Theft and Security

Figure 4 shows the theft rate of the four models examined, both before and after security measures were introduced. The results show that in three of the four models a lower proportion of cars were stolen after the introduction of security features. In the case of the fourth, the Vauxhall Carlton, there was only a slight decrease in the theft rate, but this was from a much lower rate of theft to begin with leaving little scope for further improvements.

Figure 4. Impact of the introduction of security measures in selected models



What can be deduced from these results and how much of the perceived reduction is due to improvements in security? There is little doubt that some improvement in theft rates would be expected in the newer versions of each model regardless of security improvements. This may be because the newer cars are looked after more, reside in the better-off areas which are less prone to theft (the older versions often being second/third hand cars in poorer areas) and are more likely to be garaged overnight.

In order to try and distinguish between the effects of security and the effects of age on the theft rate of these models, the theft rate for the average car (i.e. the theft rate for all models of car combined together) was calculated for the age groups corresponding to both the secure and the insecure versions of each of the four models in question (i.e. two averages were calculated for each of the four models, an average for all vehicles registered over the pre-security years of each of the four models, and an average for all vehicles corresponding to the post security years of each of the four models). The change in theft rate between the secure and insecure versions of each of the four specific models was then compared with the percentage change in theft rate of the average car corresponding to the same two age groups.

Taking the Vauxhall Cavalier as an example; the pre-security period for this model corresponded to the Mk2 range (1981-1987), whilst the post security period covered the Mk3 range (1988 to 1990). The theft rate for both of these Cavalier ranges was calculated as was the average theft rate for all cars registered between 1981 and 1987 and (separately) all cars registered between 1988-1990. The change in the theft rate of the two Cavalier ranges was then compared with the percentage change between the two average theft rates for all cars (i.e. for cars registered between 81-87 and between 88-90). Each of the 4 models had their own pair of average theft rates calculated in this way corresponding to the pre and post security periods of each model.

The horizontal line over the bar representing the more secure model in figure 4, shows the theft rate that results if the percentage change in theft rate for the average car is applied to these specific models (e.g. if the average car's theft rate drops 20% between the two periods then a 20% reduction is applied to the theft rate of the pre-security model to produce the bar shown above the post-security model). It shows the theft rate that might have been expected had this model simply reflected the change in theft rate for the average car between these age groups. In other words the horizontal line is a more accurate representation of changes in theft rate due to changes in the age of vehicles alone rather than security specific changes.

Although this analysis produces only an estimate of the effects of age on theft rate, this does go someway to showing that these particular vehicles have a theft rate lower than can be explained by changes in age alone. Again, the exception to this is the Vauxhall Carlton where the numbers stolen were too small for a meaningful analysis to be undertaken.

Substantial drops in theft rates following significant modifications to door and steering locks have been reported in the USA (HLDI, 1990) and Australia (NRMA, 1990). In Australia, theft rates of high risk models, which previously had been twice the average of all vehicles, fell to average levels following improvements in door and steering lock security. In the USA other examples show an initial improvement in theft rates following the introduction of highly sophisticated steering locks; however, they then show theft rates returning to their previously high levels after several years, possibly because thieves eventually learn how to overcome the new security features.

The security features introduced in the models in this study included more secure locks, central and deadlocking (Cavaliers), reduced or no sill buttons and labyrinth door shuts to prevent implements from being inserted between door and door-frame. Car security experts agree that these are all improvements but that none of these cars can be considered to be completely secure where the experienced thief is concerned. The security of a car depends upon a whole series of related features; it is the weakest link in this series that often lets the thief in and renders useless any improvements elsewhere. It may well be that a substantial number of car thieves are amateurish and are sufficiently deterred by the improvements made; the arguments, however, are far from conclusive.

Studies in the USA (HLDI, 1990) have reported large reductions in theft losses following the release of new model ranges with major re-designs. Some thefts occur due to demand for replacement parts. After a major re-design the parts for the new model may no longer be interchangeable with the older version resulting in a fall in demand for the new model by thieves stealing for spare parts. Care needs to be taken, therefore, in drawing conclusions from changes in theft rates between different model ranges.

Vehicle Age and Car Theft

Figure 5 shows the age population for vehicles on the road over the sample period. This is taken from the SMMT census which contained information on the number of vehicles on the road, by detailed vehicle category, and by year of registration for the period between 1976 to 1989. For most years of registration the newer cars are usually more numerous than older cars (althouh the dramatic fall in new car sales in recent years may have changed this). The figure shows that there are still a substantial proportion of older cars on the road, with more than 55% of cars on the road being over 5 years old, and over 20% of cars more than 10 years old. This means that improvements in car security introduced into new vehicles by manufacturers will take many years to impact upon the overall level of car crime - even if they are effective and all manufacturers adopt them.

Figure 6 shows the *number* of cars stolen over the sample period for each of the years of vehicle registration. The figures for cars registered over the last year (1989/90) cannot be included since only a proportion of these models were on the road during the year and the exposure to theft of these would therefore be much lower than older models. Apart from the 1985/86 registration year, the theft figures show a gradual decline in the numbers of cars stolen as the age of the car increases up to 1980. This corresponds with the declining number of vehicles on the road for these ages (figure 5). There is a significant increase m cars stolen around the 1978-1980 period corresponding to those heavily stolen older cars found at the top of the index (appendix C), such as the Ford Escort Mk2 and Cortina Mk4.

Figure 7 relates the numbers of cars stolen, for each registration year (as shown in figure 6), to the number on the road (as shown in figure 5). It can be seen that the theft

Figure 5. Numbers of vehicles on the road by vehicle age

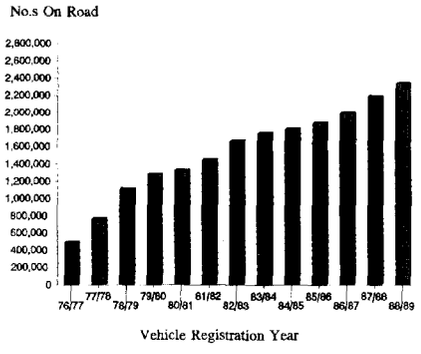


Figure 6. Numbers of which stolen by vehicle age

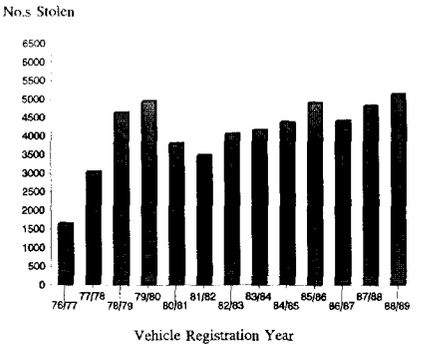
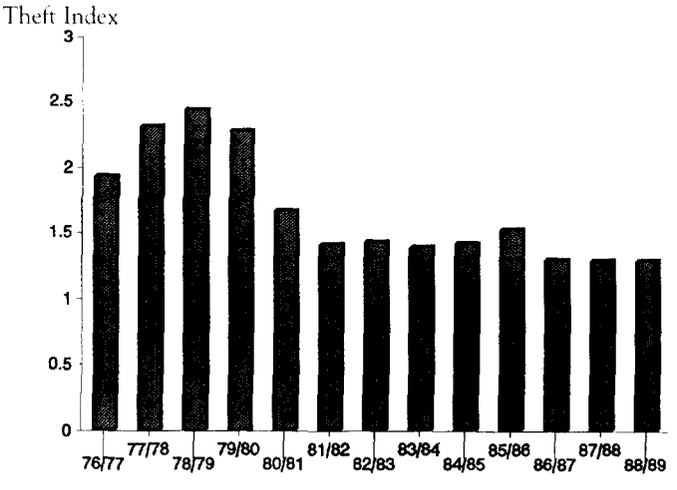


Figure 7. Theft rate by vehicle age



rate is remarkably constant for cars registered between 1986 and 1988, rising for those registered in 1985/86 and then falling back slightly to a rate little higher than in the 1986-88 period. The highest theft rates are found in the very old cars which appear towards the top of the theft index. These are the 9, 10, 11 years old cars (1979/80 and before) such as the older Ford Escorts (Mks 1 and 2), Cortinas (Mks 4 and 5) and Capris (Mks 2 and 3).

There are several possible reasons for such high theft rates in older cars as outlined earlier in this section. It is interesting to note that similar results have been obtained in other countries. The Australian NRMA index, for example, (NRMA, 1990) showed a peak in theft rates for models registered between 1977 and 1979. The same result was found in both vehicles stolen which were subsequently recovered and for

those which were never recovered. The major cause in Australia was seen as the higher demand for spare parts for these older cars, most of which were no longer in production and therefore required spare parts which were in short supply.

The Future for the Car Theft Index

This work has highlighted a number of areas of concern including the alarming rates of theft of performance models and the higher than expected theft rates amongst very old cars. It has also provided some evidence that additional security measures might have had some impact on car crime. Car theft is a complex area and if preventive measures are to have any effect there is a need to understand the exact nature of the problem and to target measures accordingly. Provision of statistics of this type can help with this process, particularly if they are produced on a regular basis.

The vehicle park is constantly changing with new, hopefully more secure, vehicles arriving and many of the older vehicles being taken off the road. There would undoubtedly be advantages in the production of some form of index on a regular basis to allow the effects of this change, as well as other changes in the security of existing vehicles, to be monitored by both researchers and manufacturers. It may be, for example, that if the security of higher performance cars was improved significantly the overall theft rate would reduce. Alternatively, theft might simply be displaced to other types of vehicle. It is ony through examination of statistics of this type that an impression can be gained of the overall impact of different measures.

It would be advantageous to obtain a much larger proportion of the national theft data to allow a more detailed breakdown and examination of the theft rates of precise categories of vehicle. However, the main obstacle to producing any type of theft index on a regular basis is the absence of a reliable, national database of vehicle theft. The only option at present is to obtain samples of theft data from police forces which, given the difficulties involved in such an exercise, is not a practical proposition on a regular basis.

The establishment of a national source of stolen vehicle statistics also opens up possibilities for other applications. It has already been suggested that up-to-date and detailed information on car theft and recovery rates could be used by police stolen vehicle squads to aid detection of car thieves by rapidly identifying local patterns in car theft as they emerge (Hinchliffe, 1991). A more detailed examination of the differences in the patterns of car theft in different areas of the country and between large conurbations and other areas might also help to reveal facts about the nature of car crime which could be used to shape future car crime prevention policy.

Without this type of information the police, manufacturers and crime prevention practitioners often have to rely on anecdotal evidence which may be misleading. In these circumstances there is the danger that preventive measures will not be targeted in the right areas and those that are applied may be inappropriate to the problems and do little to reduce car crime in the long term.

Appendix A Police Forces Supplying Data For The Index

We are grateful to the following forces who supplied registration numbers of cars involved in car theft for use in the index.

- Bedfordshire
- Cambridgeshire
- Cleveland
- Devon and Cornwall
- Durham
- Gloucestershire
- Hertfordshire
- Humberside
- Lancashire
- Leicestershire
- London Metropolitan
- Norfolk
- Northumbria
- North Wales
- Surrey
- Thames Valley

Appendix B Methodological and Statistical Procedures

Processing Stolen Vehicle Information

It was essential that the classification system used for the vehicle park data should relate exactly to that used for vehicle theft. Since the classification of vehicles can be quite involved it was decided that the individual classification schemes used by different organisations (the police, the PNC, insurance companies, etc) could not be relied upon. A decision was taken that all information would be re-classified using the vehicle registration number (VRN). The data obtained from the DVLA made it possible to convert any VRN into an exact DVLA make/model code. This provided a common basis for vehicle classification across the various sources of data and enabled different sources of data to be cross-checked against each other. Under this system the basic requirement for data on stolen vehicles was simply a VRN for every vehicle stolen within the period in question (1 November 1989 to 31 October 1990). Car theft data used to produce the index was collated from police forces (figure 8, box 1). However, car theft data was also collected from the Association of British Insurers and from the DVLA for comparison with the police data.

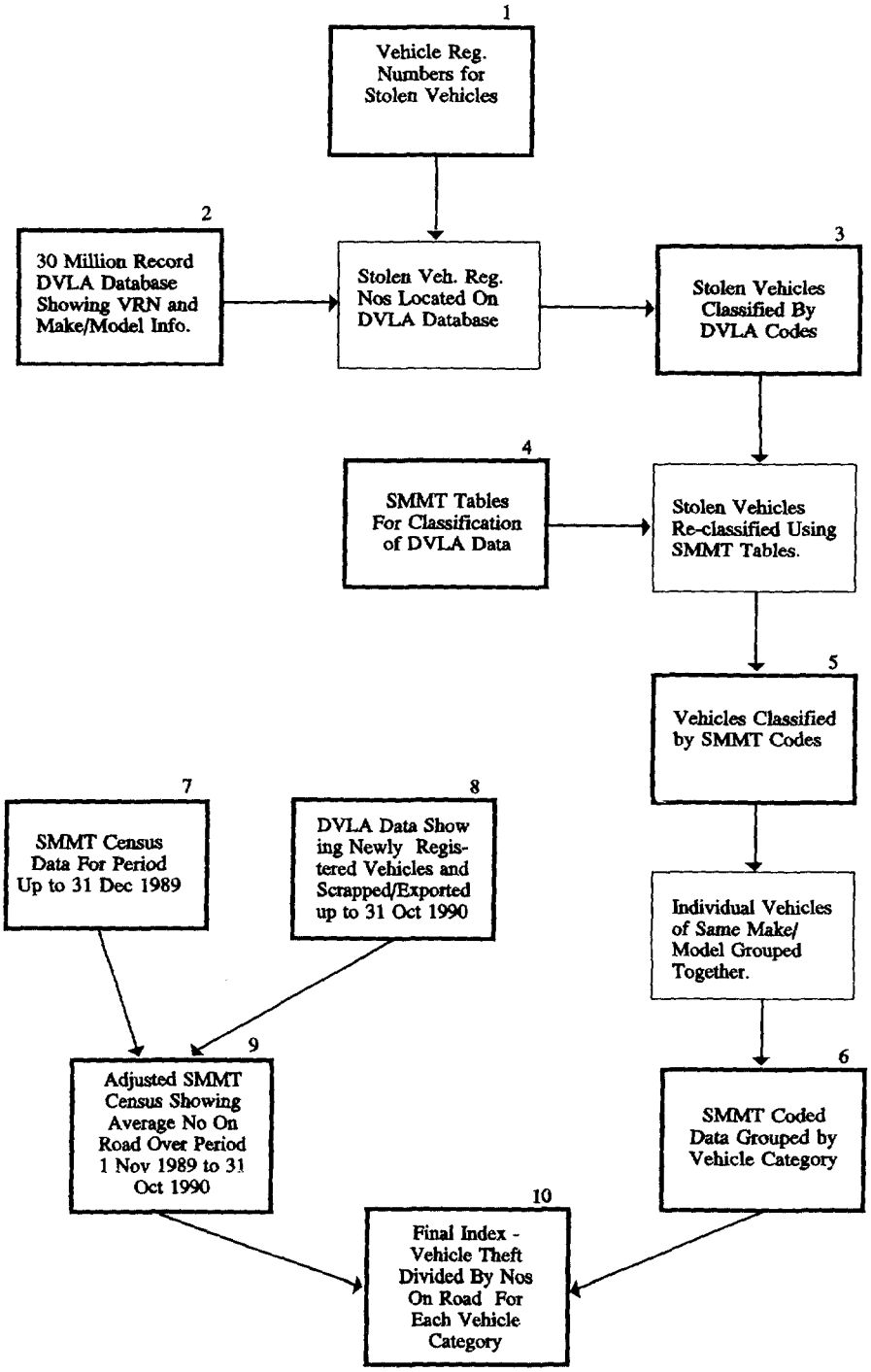
In order to translate a VRN into a make/model code it was necessary to set up part of the DVLA vehicle database on a local computer. This contained information on approximately 30 million VRNs including, for each one, its precise make and model, cubic capacity, date of registration and other relevant information (figure 8, box 2).

Using relational database techniques, the VRNs of stolen vehicles obtained from police forces and the ABI were linked to the DVLA database and automatically supplemented with the necessary make/model/engine capacity information needed to classify each VRN (box 3).

Once the VRN information had been classified with the DVLA make/model codes it was necessary to translate these into the equivalent SMMT classification system to enable it to be compared with the SMMT vehicle park statistics. SMMT were able to supply a number of computer-based tables to assist with this process (box 4). The DVLA classified data was processed with these tables to produce a final set of stolen vehicle data with an exact SMMT make model code attached to each vehicle (box 5).

The final step in the analysis of the stolen vehicle data was to group together vehicles of the same make/model category to produce a final count of the total number of vehicles stolen within each category (box 6). At this stage the information on vehicle park for each basic category of vehicle was added. Vehicles were then grouped and analysed in a number of different ways in order to determine the most appropriate categorisation system.

Figure 8. Outline of processes involved in constructing the car theft index



Processing the Vehicle Park Information

The basic vehicle park information was derived from the SMMT 1989 census (figure 8, box 7). This covered the period up to 31 December 1989. In order to supplement this to cover the sample period (1 November 1989 to 31 October 1990), data was obtained from the DVLA database showing the make/model of all vehicles which had been newly registered over the simple period and all vehicles which had left the vehicle park during the period for whatever reason (scrapped or exported vehicles, etc) (figure 8, box 8).

The DVLA make/model code for each of these vehicles was obtained and translated into the equivalent SMMT code. Vehicles with the same detailed make/model were grouped together to produce a set of supplementary data composed of counts of the total number of vehicles of each SMMT make/model newly registered or scrapped/exported. The 1989 SMMT census was then supplemented with this data by, first, adjusting it back 2 months to the position as at 1 November 1989 and then, secondly, adding or subtracting the supplementary data on vehicles entering/leaving the vehicle park to produce a final SMMT census showing the average number of vehicles of each category on the road over the sample period (figure 8, box 9).

In order to calculate the average number of vehicles on the road over the period, only vehicles from the supplementary data which were registered at the start of the first month of the sample period (or which did not leave the vehicle park until the end of the last month) were counted as whole vehicles, the remainder of the supplementary data being counted as fractions of a vehicle. For example, if a vehicle has only been on the road for 1 month during the sample period it was obviously less at risk of theft during the period as a whole than a vehicle that had been on the road for the full 12 months. It was therefore counted as one twelfth of a vehicle in the vehicle park statistics since, on average, it had only been on the road for one twelfth of the period.

The final vehicle park statistics, grouped by SMMT category, were then merged with the stolen vehicle information which had already been categorised in this way and the indices were produced (figure 8, box 10). Categories which contained too few vehicles to be reliably placed in the index were excluded.

Producing the Car Theft Indices

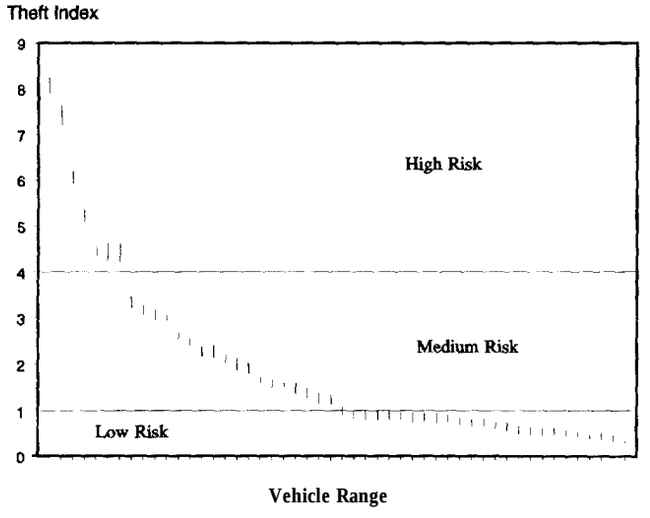
Each of the car theft indices were formed by dividing the numbers of vehicles stolen within each vehicle category by the average number of vehicles of that category on the road over the same period. This was a simple ratio which made allowance for the fact that certain makes/models of vehicle were far more numerous than others and would, all other things been equal, be more likely to be stolen. A high ratio indicated a high number of vehicles stolen and vice-versa.

Because the number of stolen vehicles in each category was obtained as a sample of the national stolen vehicle figures, the ratios had associated with them a margin of

error. If a different stolen vehicle sample were to be taken a slightly different result might be expected. Because of this it was necessary to represent each ratio not as a single figure but as a range of ratios with an upper and lower limit. Only vehicle categories whose ranges did not overlap could be said to be significantly different.

This overlap between ranges meant that it was not possible to produce a ranked list of vehicle categories. Instead, it was decided that the vehicle categories would be divided into a small number of "risk groups" (high, medium and low risk of theft). The decision on how the ratios were to be divided between these groups was taken using graphical analysis of the data to show how the theft ratios were distributed. The dividing line between these risk groups was drawn with reference to both the average theft rate of all vehicles and the need to minimise movement between risk groups should a different sample be taken. An example of how this was done is shown in figure 9 below.

Figure 9. Graphical analysis for model range index



| - Range of theft indices for each vehicle. The most likely index is at the mid-point of the line.

Average theft rate (all vehicles) - 2%. Risk boundaries drawn at 1% below the average rate but 2% above to take into account the wider spread of theft indices above the average theft rate.

Testing For Bias in the Car Theft Sample

Because of the difficulties in obtaining accurate vehicle park figures for particular areas of the country the vehicle park used in this study was based on an overall figure for England and Wales. However, it was only possible to obtain a sample of car theft figures covering part of the country. In order to ensure that the sample areas chosen

were not biased towards or away from particular car models, a second set of vehicle park figures were calculated based on the vehicles registered in the sample areas taken together. A new index was then produced based on the second set of vehicle park figures and this was compared to the original to assess the stability of the car theft index.

The number of vehicles of each type registered in an area may, of course, bear little resemblance to the number of vehicles of each type actually present in an area and exposed to theft. This is particularly the case in cities with a large road commuter population. Indeed, the number of vehicles registered in an area can itself be misleading in some cases due to the practice of many companies and leasing businesses of registering all their vehicles at one company address, regardless of where in the country they are actually located and used.

Despite these problems it was felt that the place of registration would provide an approximation as to how well the sample area used in the study matched the distribution of vehicles in the country as a whole. The appropriate data on place of registration was extracted from the DVLA database. The location code was in the form of a postcode which was then converted to a county code. The counties were then converted to the appropriate police force area. Vehicles registered in the police force areas used in the study were extracted from the DVLA database and the number of vehicles of each type were calculated in order to provide the vehicle park figures specific to the sample area. The car theft index was then re-calculated on the basis of the new vehicle park figures and compared to the original index.

Using the car theft index for all model ranges as a basis for comparison (appendix C) it was found that there was a very high consistency between the two indices. The main differences were that the Astra Belmont dropped from the high risk band to the top of the medium risk hand whilst the Granada Mk1 (previously just outside the high risk band) now went from medium risk to high risk. There was no other movement between these hands. Some dozen or so vehicles moved between the low and medium risk bands. Much more variability would be expected here since, as can be seen from figure 9, the car theft ratios are packed much closer together at the bottom of the index.

Overall, the exercise showed that although a different basis for vehicle park produced many changes in the order of vehicles within a risk band there was very little movement between bands. This illustrated both the validity of the sample used and the robustness of the handling system which was able to withstand changes in the base data and still produce consistent results.

Appendix C The Car Theft Index – All Model Ranges

The following table is a listing of car model ranges in England and Wales divided into high, medium and low risk of theft. Model ranges are listed in alphabetical order within each risk band. The risk of theft has been calculated by taking the numbers of each range stolen during a period and dividing this by the average number of cars within each range on the road during the period. The figures represent an average theft rate for each range. This may disguise much higher or lower theft rates for parts of the range. For example, it is known that higher performance cars within each range are much more likely to be stolen whilst estate versions of each range are less likely to be stolen.

HIGH RISK

FORD CAPRI MK2
FORD CAPRI MK3
FORD CORTINA MK2
FORD CORTINA MK3
FORD CORTINA MK4
FORD CORTINA MK5
FORD ESCORT MK1
FORD ESCORT MK2
FORD FIESTA MK1
FORD GRANADA MK2/3
ROVER METRO MK2
VAUXHALL ASTRA BELMONT
VAUXHALL ASTRA MK2

MEDIUM RISK

ALFA ROMEO 75
ALFA ROMEO ALFASUD
ALFA ROMEO ALFETTA
ALFA ROMEO GIULIETTA
AUDI 90
AUDI COUPE
AUS/MOR 1100/1300
AUS/MOR 1800
BMW 1/2/3000 SERIES
BMW 300 SERIES
BMW 500 SERIES (E12)
BMW 500 SERIES (E28)
BMW 600 SERIES (E24)
BMW 700 SERIES (E23)
DACIA (ALL RANGES)
DAIHATSU FOURTRAK MK1
DAIHATSU FOURTRAK MK2
DAIMLER SOVEREIGN
FIAT 132
FIAT CROMA
FIAT MIRAFIORI
FIAT STRADA MK1/2
FORD CAPRI MK1
FORD CLASSIC/CORSAIR
FORD ESCORT MK3
FORD FIESTA MK2
FORD FIESTA MK3
FORD GRANADA MK1
FORD GRANADA MK4
FORD ORION MK1
FORD SIERRA MK1
FORD SIERRA MK2
FORD SIERRA SAPPHIRE
HILLMAN MINX
HONDA INTEGRA
ISUZU TROOPER
JAGUAR XJ/XJS
LADA 1300
LANCIA BETA
LANCIA DELTA
LANCIA THEMA
LANDROVER DISCOVERY
LOTUS ECLAT
MAZDA 323 MK3
MAZDA MONTROSE
MAZDA RX
MITSUBISHI/COLT CELESTE
MITSUBISHI/COLT CORDIA
MITSUBISHI/COLT LANCER
MITSUBISHI/COLT SAPPORO
MITSUBISHI/COLT SHOGUN
MITSUBISHI/COLT SIGMA
MORRIS MINOR
NISSAN/DAT. BLUEBIRD MK1
NISSAN/DATSUN PATROL
NISSAN/DATSUN SILVIA
NISSAN/DATSUN VIOLET
NISSAN/DATSUN Z/ZX
OPEL ASCONA
OPEL KADETT
OPEL MANTA
OPEL SENATOR
PEUGEOT 504
PEUGEOT 604
PORSCHE 911
PORSCHE 924
PORSCHE 928
PORSCHE 944
RANGE ROVER
RENAULT 30
ROVER 2000
ROVER 3000
ROVER 200 MK2
ROVER 400
ROVER MAESTRO
ROVER METRO
ROVER MINI
ROVER MONTEGO
SAAB 900
SEAT MARBELLA
SIMCA 1100
TOYOTA CARINA MK1
TOYOTA CELICA
TOYOTA CORONA
TOYOTA CRESSIDA
TOYOTA HI-LUX 4X4
TOYOTA LANDCRUISER
TOYOTA MR2
TOYOTA SUPRA
TRIUMPH 1300
TRIUMPH GT6
TRIUMPH HERALD
TRIUMPH SPITFIRE
TRIUMPH VITESSE
VAUXHALL ASTRA MK1
VAUXHALL BELMONT
VAUXHALL CAVALIER MK1
VAUXHALL CAVALIER MK2
VAUXHALL FIRENZA
VAUXHALL NOVA
VAUXHALL ROYALE
VAUXHALL VELOX
VAUXHALL VIVA HC
VOLKSWAGEN GOLF MK1
VOLKSWAGEN GOLF MK2
VOLKSWAGEN JETTA MK2
VOLKSWAGEN SOROCCO

LOW RISK

ALFA ROMEO 33
ASTON MARTIN
AUDI 80
AUDI 100 MK1
AUDI 100 MK2
AUDI 200
AUSTIN ALLEGRO MK1/2
AUSTIN ALLEGRO MK3
AUSTIN/MORRIS A30-135
AUSTIN/MORRIS AMBASSADOR
AUSTIN/MORRIS MAXI
AUSTIN/MORRIS PRINCESS
BENTLEY (ALL RANGES)
BMW 500 SERIES (E34)
BMW 700 SERIES (E32)
CITROEN 2 CV
CITROEN AX
CITROEN BX
CITROEN CX
CITROEN DYANE
CITROEN GS/GSA
CITROEN VISA
CITROEN XM
DAF (ALL RANGES)
DAIHATSU CHARADE MK1
DAIHATSU CHARADE MK2
DAIHATSU CHARMANT
DAIMLER DOUBLE-SIX
FIAT 126
FIAT 127
FIAT 128
FIAT PANDA MKl
FIAT PANDA MK2
FIAT REGATA MK1
FIAT REGATA MK2
FIAT STRADA MK3
FIAT TIPO
FIAT UNO MK1
FIAT UNO MK2
FIAT X1/9
FORD ANGLIA/PREFECT
FSO (ALL RANGES)
GENERAL MOTORS USA (ALL RANGES)
HILLMAN HUNTER
HILLMAN IMP
HONDA ACCORD
HONDA BALLADE
HONDA CIVIC
HONDA CONCERTO
HONDA LEGEND
HONDA PRELUDE
HUMBER (ALL RANGES)
HYUNDAI PONY MK1
HYUNDAI PONY MK2
HYUNDAI STELLAR
JENSEN (ALL RANGES)
LADA 1200
LADA 1500
LADA 1600
LADA NIVA
LADA RIVA
LADA SAMARA
LANCIA PRISMA
LANCIA Y10 MKl
LANDROVER 109
LANDROVER 110
LANDROVER 88
LANDROVER 90
LOTUS ESPRIT/ELAN
MAZDA 121
MAZDA 323 MK1
MAZDA 323 MK2
MAZDA 626 MK1
MAZDA 626 MK2
MERCEDES 190
MERCEDES COMPACTS
MERCEDES G-WAGON
MERCEDES S CLASS
MERCEDES SPORTS
MG MGB
MITSUBISHI/COLT 1200
MITSUBISHI/COLT 1400
MITSUBISHI/COLT GALANT
MITSUBISHI/COLT TREDIA
MORGAN (ALL RANGES)
MORRIS ITAL
MORRIS MARINA
NISSAN/DATSUN BLUEBIRD MK2
NISSAN/DATSUN CHERRY
NISSAN/DATSUN LAUREL
NISSAN/DATSUN MICRA
NISSAN/DATSUN PRAIRIE
NISSAN/DATSUN STANZA
NISSAN/DATSUN SUNNY MK 1-4
NISSAN/DATSUN SUNNY MK5
OPEL MONZA
OPEL REKORD
PEUGEOT 104
PEUGEOT 205
PEUGEOT 305
PEUGEOT 309
PEUGEOT 405
PEUGEOT 505
PROTON (ALL RANGES)
RELIANT SCIMITAR
RENAULT 4
RENAULT 5 MK1
RENAULT 5 MK2
RENAULT 9
RENAULT 11
RENAULT 12
RENAULT 14
RENAULT 16
RENAULT 18
RENAULT 19
RENAULT 20
RENAULT 21
RENAULT 25
RENAULT ESPACE
RENAULT FUEGO
ROLLS ROYCE
ROVER 200 MK1
ROVER 60-110
ROVER 800
SAAB 9000
SAAB 95/96
SAAB 99
SEAT IBIZA
SEAT MALAGA
SINGER (ALL RANGES)
SKODA ESTELLE MK1
SKODA ESTELLE MK2
SKODA FAVORIT
SUBARU 2WD
SURARU 4WD
SUBARU JUSTY
SUNBEAM (ALL RANGES)
SUZUKI SJ
SUZUKI SWIFT
SUZUKI VITARA
TALBOT ALPINE
TALBOT AVENGER
TALBOT HORIZON
TALBOT SAMBA
TALBOT SOLARA
TALBOT SUNBEAM
TALBOT TAGORA
TOYOTA CAMRY
TOYOTA CARINA MK2
TOYOTA CARINA MK3
TOYOTA COROLLA
TOYOTA STARLET
TOYOTA TERCEL
TRIUMPH 1500
TRIUMPH 2500
TRIUMPH ACCLAIM
TRIUMPH DOLOMITE
VAUXHALL CARLTON
VAUXHALL CAVALIER MK3
VAUXHALL CHEVETTE
VAUXHALL VICTOR/VX
VAUXHALL VIVA HA/HB
VAUXHALL/OPEL SENATOR
VOLKSWAGEN BEETLE
VOLKSWAGEN DERBY
VOLKSWAGEN JETTA MK1
VOLKSWAGEN PASSAT
VOLKSWAGEN POLO
VOLKSWAGEN SANTANA
VOLVO 140
VOLVO 160
VOLVO 440
VOLVO 480
VOLVO “200”
VOLVO “300”
VOLVO “700”
ZASTAVA YUGO

References

Clarke, R. (1990). *Model Specific Theft Rates: Experience in the United States and Australia.* Internal Report for the Home Office (Unpublished).

Clarke, R., Harris, P. (1991). *A Rational Choice Perspective On The Targets Of Auto Theft.* Criminal Behaviour and Mental Health.

Highway Loss Data Institute (1990). *Insurance Theft Report: Passenger Cars, Vans, Pickups and Utility Vehicles.* HLDI Report T-89-1, Arlington, Virginia 22201.

Hinchliffe, M. (1991). *Motor Vehicle Thefts: Crime Information and Analysis Requirements Using the Police National Computer.* Report for ACPO Working Party Examining a National Strategy for Vehicle Theft (Unpublished).

Home Office. (1988). *Standing Conference on Crime Prevention: Report of the Working Group on Car Crime.* London: Home Office.

Mayhew, P., Elliott, D,. Dowds, L. (1988). *The British Crime Survey.* Home Office Research Study No 111. London HMSO.

NRMA Insurance Limited (1990). *Car Theft in New South Wales: An Update by NRMA Insurance Limited,* NRMA Insurance Ltd, Sydney, Australia, (ISBN 0949605 39 5).

Smyth, G. (1990). *Greater Manchester Probation/Police Car Crime Campaign: Results of Probation Offenders Questionnaire.* Greater Manchester Probation Service Report (Unpublished).

Webb, B., Laycock, G. (1992), *Tackling Car Crime,* Crime Prevention Unit Paper 32. London: Home Office.

WHICH (1991). *Cars At Risk.* WHICH Report on Car Security, February 1991, pp107-109.

Police Research Group Crime Prevention Unit Series

1. **Reducing Burglary: a study of chemists' shops.** Gloria Laycock. 1985. v+7pp. (0 86353 154 8).
2. **Reducing Crime: developing the role of crime prevention panels.** Lorna J. F. Smith and Gloria Laycock. 1985. v+14pp. (0 86252 189 0).
3. **Property Marking: a deterrent to domestic burglary?** Gloria Laycock. 1985. v+25pp. (0 86252 193 9).
4. **Designing for Car Security: towards a crime free car.** Dean Southall and Paul Ekblom. 1986. v+25pp. (0 86252 222 6).
5. **The Prevention of Shop Theft: an approach through crime analysis.** Paul Ekblom. v+19pp. (0 86252 237 4).
6. **Prepayment Coin Meters: a target for burglary.** Nigel Hill. 1986. v+15pp. (0 86252 245 5).
7. **Crime in Hospitals: diagnosis and prevention.** Lorna J. F. Smith. 1987. v+25pp. (0 86252 267 6).
8. **Preventing Juvenile Crime: the Staffordshire Experience.** Kevin Heal and Gloria Laycock. 1987. v+29pp. (0 86252 297 8).
9. **Preventing Robberies at Sub-Post Offices: an evaluation of a security initiative.** Paul Ekblom. 1987. v+34pp. (0 86252 300 1).
10. **Getting the Best out of Crime Analysis.** Paul Ekblom. 1988. v+38pp. (0 86252 307 8).
11. **Retail Crime: Prevention through Crime Analysis.** John Burrows. 1988. v+30pp. (0 86252 313 3).
12. **Neighbourhood Watch in England and Wales: a locational analysis.** Sohail Husain. 1988. v+63pp. (0 86252 314 1).
13. **The Kirkholt Burglary Prevention Project, Rochdale.** David Forrester, Mike Chatterton and Ken Pease with the assistance of Robin Brown. 1988. v+34pp. (0 86252 333 8).
14. **The Prevention of Robbery at Building Society Branches.** Claire Austin. 1988. v+18pp. (0 86252 317 0).
15. **Crime Prevention and Racial Harassment in Asian-run Small Shops: the scope for prevention.** Paul Ekblom and Frances Smith with the assistance of Sneh Birdi. 1988. v+54pp. (0 86252 348 6).
16. **Crime and Nuisance in the Shopping Centre: a case study in crime prevention.** Susan Phillips and Raymond Cochrane. 1988. v+32pp. (0 86252 358 3).
17. **The Prevention of Fraud.** Michael Levi, 1988. v+19pp. (0 86252 359 1).
18. **An Evaluation of Domestic Security Surveys.** Gloria Laycock. 1989. v+33pp. (0 86252 408 3).
19. **Downtown Drinkers: the perceptions and fears of the public in a city centre.** Malcolm Ramsey. 1989. v+23pp. (0 86252 419 9).
20. **The Management and Prevention of Juvenile Crime Problems.** Barrymore Cooper. 1989. v+63pp. (0 86252 420 2).

21. **Victim Support and Crime Prevention in an Inner-City Setting.** Alice Sampson and Graham Farrell. 1990. v+27pp. (0 86252 504 7).
22. **Lagerland Lost? An experiment in keeping Drinkers off the street in central Coventry and elsewhere.** Malcolm Ramsey. 1990. v+38pp. (0 86252 520 9).
23. **The Kirkholt Burglary Prevention Project: Phase II.** David Forrester, Samantha Frenz, Martin O'Connell and Ken Pease. 1990. v+51pp. (0 86252).
24. **Probation Practice in Crime Prevention.** Jane Geraghty. 1991. v+45pp. (0 86252 605 l).
25. **Lessons from a Victim Support Crime Prevention Project.** Alice Sampson. 1991. v+41pp. (0 86252 616 7).
26. **The Prevention of Cheque and Credit Card Fraud.** Michael Levi, Paul Bissell and Tony Richardson. 1991. v+52pp. (0 86252 633 7).
27. **Making Crime Prevention Pay: initiatives from business.** John Burrows. 1991, v+50pp. (0 86252 629 9).
28. **The Influence of Street Lighting on Crime and Fear of Crime.** Stephen Atkins, Sohail Husain and Angele Storey. 1991. v+59pp. (0 86252 668 X).
29. **The Effect of Better Street Lighting on Crime and Fear: a Review.** Malcolm Ramsey with the assistance of Rosemary Newton. 1991. v+48pp. (0 86252 670 1).
30. **Reducing Crime on the London Underground.** Barry Webb and Gloria Laycock, 1992. vi+30pp. (0 86252 688 4).
31. **Assessing Crime Prevention Initiatives: The First Steps.** Geoff Berry and Mike Carter. 1992. v+46pp. (0 86252 823 2).
32. **Tackling Car Crime.** Barry Webb and Gloria Laycock. 1992. v+32pp. (0 86252 832 1).