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Regulating crime prevention design into consumer products: Learning the lessons from electronic vehicle immobilisation

Rick Brown

Foreword | *Despite significant reductions in recent years, acquisitive property crime remains the single largest crime category, with over 700,000 offences recorded annually by police in Australia. There is potential to further reduce the scale of such offending and the subsequent costs to society by focusing attention on the design of frequently stolen consumer products in order to reduce their vulnerability to theft. While there is a variety of ways of engaging with manufacturers, government regulation may ultimately be required if other approaches prove unsuccessful.*

This paper examines the lessons that can be learned as a result of the regulation of motor manufacturers to install electronic immobilisers on all new cars from July 2001, which has contributed to significant reductions in vehicle crime over the past decade. Eight generic lessons for future regulation of crime prevention design in consumer products are outlined. These lessons should assist policymakers to identify how the costs incurred by the criminal justice system in dealing with acquisitive property crime could be shifted to manufacturers, who arguably contribute to the problem by the way they design and market their consumer products.

Adam Tomison
Director

Popular consumer products, such as smartphones, tablets and MP4 players are typically in demand on both the legitimate and illegitimate markets (Sutton 1998). While demand in the legitimate market will be met by the retail sector, the illegitimate market will be supplied by various forms of theft and in some cases, by counterfeiting. A study by Fitzgerald and Poynton (2011) of items stolen in burglaries in New South Wales in 2010 showed that consumer products were frequently stolen. Of the residential burglaries where the police recorded at least one object stolen, 26 percent involved the theft of a laptop, 15.3 percent involved the theft of a still camera, 14.6 percent involved the theft of a mobile phone and 10.8 percent involved the theft of a television. Rollings (2008) estimated the average property loss from residential burglaries in 2005 to be $1,040, some of which will no doubt have resulted from the theft of consumer products.

Clarke (1999) has noted that objects are more likely to be stolen when they exhibit the characteristics of 'hot products'. These characteristics include *availability* (consumer products are usually readily available and this makes them available to steal), *valuable* (objects that are stolen will usually have a resale value), *enjoyable* (objects that bring enjoyment are often more likely to be stolen—hence a television is more likely to be stolen than a microwave), *disposable* (objects are more likely to be stolen if they can be on-sold with little difficulty), *removable* (the object has to be easily transported by the thief) and *concealable* (the object will usually be easy to hide and will not be traceable to the owner). One or more of these characteristics can make a popular item a target.

The popularity of these items for thieves can be viewed as a 'spill-over' effect, or economic externality (Breyer 1998) that derives from manufacturers' marketing efforts by increase the consumer demand for their products. Unfortunately, in generating that demand, the

manufacturers also unwittingly create undesirable criminal outcomes, with the theft and subsequent resale of popular consumer products acting to satisfy at least part of consumer demand. The opportunity created by the availability of desirable and insecure consumer products therefore drives the theft of these items (Felson & Clarke 1998). Indeed, Farrell and Roman (2006) described how crime as an economic externality can be likened to pollution that is emitted by businesses and creates a social cost for the population in general.

When a theft does occur, it is typically seen as a problem for consumers, who bear the direct costs of the loss, as well as the inconvenience and potential emotional distress caused by victimisation. Such thefts also result in a significant cost being incurred by the state through the administration of the criminal justice system, which affects all taxpayers—both consumers and non-consumers of the products in question. For example, a study of the costs of crime in the United Kingdom in 2003–04 found that the average value of the property stolen in a residential burglary was £846, while the average cost to the criminal justice system for such a crime was £1,137 (Dubourg & Hamed 2005).

However, Scott (2005) has argued that sharing, or shifting responsibility for crime away from the criminal justice system towards others who can influence, or control crime events, can be an effective means of reducing crime. Indeed, if responsibility for the theft of consumer products could be shared with, or in part shifted to manufacturers, there could be significant savings to the criminal justice system, especially if the thefts could be prevented in the first instance. Indeed, Mazerolle and Ransley (2012) have argued that policymakers are already employing regulatory approaches with third parties beyond the criminal justice system as a means of crime control, although this has been somewhat piecemeal.

Unfortunately, in the context of consumer products, manufacturers and the designers they employ have often proven reluctant to share any responsibility for their products being targets of crime. Clarke and Newman (2005) noted that this reluctance can occur:

- when manufacturers are developing new products, before their vulnerabilities become known;
- when changes are expensive or inconvenient, or where their effectiveness is unknown;
- where the crimes they generate are considered trivial, or where there is limited public concern; or
- where the changes might be considered problematic for cultural reasons.

Within the context of vehicle theft (which will be used for illustrative purposes throughout this paper), Karmen (1981) documented a number of excuses used by motor manufacturers in the United States in the 1960s and 1970s for not introducing theft prevention responses that focused largely on blaming owners for being careless with their vehicles. Karmen (1981) noted the slowness and reluctance with which motor manufacturers improved security during this period and claims that vehicle thefts were in the interests of manufacturers to help bolster sales.

There is, however, a role for government in encouraging manufacturers to make design changes that reduce the risks of theft. Clarke and Newman (2005) identified eight roles for government in facilitating product change. These included the government as *bystander* (allowing product change and taking a neutral position), as *arbitrator* (between industry and consumer groups), as *enabler* (by bringing interest groups together, or altering regulations to facilitate change), as *persuader* (encouraging manufacturers to make changes through force of argument), as *financier* (providing subsidies or tax incentives for products with the desired changes), as *customer* (as a major purchaser of goods and services the government can wield significant market pressure), as *litigant* (making use of the courts to force manufacturers to change their products) and as *legislator* (changing laws to force design change).

The role of government as legislator in encouraging design change might be considered one of the last (and possibly least desirable) policy options to use with manufacturers. However, there will be cases in which it will be in the public interest (Posner 1974) to introduce new regulation that requires changes to consumer products that are intended to reduce crime. This will be the case particularly when the crime-related costs to the public (both consumers and non-consumers) outweigh the costs of regulation (both to the state and manufacturers; Shrader-Frechette 1991), where manufacturers are unwilling to voluntarily make changes and where the public alone is unable to pressure the manufacturers concerned to make the necessary changes (Breyer 1998). In such cases, government regulation may prove to be the most appropriate means by which design changes intended to reduce crime can be achieved. Indeed, in situations where manufacturers are unwilling to take unilateral action for fear of increasing prices in highly competitive markets, regulation may be welcomed for introducing a 'level playing field' for all manufacturers. A case in point was Ralph Nader's 'unsafe at any price' campaign in the United States in the 1960s, which eventually brought government regulation on all motor manufacturers to improve the safety standards of the vehicles they sold (Newman 2004).

This paper is concerned with the regulation of manufactured consumer products to reduce crime. It draws on the experiences of regulating motor manufacturers to improve new car security. More specifically, it focuses on the lessons that can be learned from the regulation of electronic vehicle immobilisation, which (as is shown later) contributed to significant reductions in vehicle theft in Australia. These lessons could be applied to a range of desirable consumer products that are susceptible to theft, including MP4 players, tablets/laptops, cameras and games consoles.

Electronic vehicle immobilisation

Electronic vehicle immobilisation typically disables two or more electrical circuits (linked to either the ignition and/or fuel pump circuits) built into the engine management system. Although there are various designs (see Potter & Thomas 2001 for an

explanation of various types of immobiliser), electronic immobilisers most commonly work through a small transponder in the ignition key that transmits a weak radio signal, broadcasting an encrypted code that is picked up by a receiver located close to the ignition lock. When the expected code is received, the electronic immobiliser is disengaged.

In Australia, electronic immobilisers became a regulatory requirement on all new cars sold from 1 July 2001. As a result, from 2001 onwards, the prevalence of improved security gradually increased as the national vehicle fleet aged and was replaced with newer vehicles, and the proportion of vehicles fitted with immobilisers increased each year. By July 2011, 71 percent of Australia's vehicle fleet had been secured with an Australian Standard or equivalent immobiliser (NMVTRC 2011).

Effectiveness of electronic vehicle immobilisation

There is some evidence of the success of electronic vehicle immobilisation in reducing the theft of vehicles in Australia. However, it should be noted that such studies are often marked by design limitations, especially in relation to the use of non-comparable experimental and control groups, consisting of vehicles with and without immobilisation.

An early study of the effectiveness of compulsory electronic immobilisation of new vehicles was undertaken by Potter and Thomas (2001) soon after the introduction of the regulatory requirements. Their study compared the theft rates of vehicles fitted with Australian Standard (AS) immobilisers, to those fitted with non-AS immobilisers and those with no immobiliser fitted. The results showed that vehicles fitted with AS immobilisers had lower theft rates than other vehicles. Examining vehicles registered after 1991, the theft rate for vehicles in 2000 was found to be 29.0 per 10,000 vehicles registered, compared with 52.8 per 10,000 for vehicles with a non-AS immobiliser fitted and 47.8 per 10,000 for vehicles with no immobiliser at all.

Potter and Thomas (2001) also undertook a separate analysis of vehicle theft patterns in Western Australia, where different regulation was introduced. Prior to the introduction of regulation requiring new and used vehicles to be immobilised from 1999 onwards in Western Australia, a voluntary scheme had operated from 1997, which encouraged the retrofit of immobilisers. This state-led scheme offered a subsidy of $30, which was deducted from the price of installing an electronic immobiliser. Following the introduction of the mandatory scheme in 1999, subsidies were initially continued (at an increased rate of $50) for the retrofitting of immobilisers. These subsidies ceased in September 2001. Analysis by Potter and Thomas (2001) showed that vehicles retro-fitted with an AS immobiliser under the voluntary scheme had an average age of 14.85 years and a rate of theft of 73.8 per 10,000 registered. By contrast, those with no immobiliser fitted were of a similar average age (15.61 years) but had a much higher theft rate, with 109.9 thefts per 10,000 registered.

This study was replicated by the National Motor Vehicle Theft Reduction Council (2007) using data for vehicles stolen in 2006. This showed that the impact of electronic immobilisation had continued, although the size of the effect had declined. While vehicles less than 10 years old that were fitted with an AS immobiliser had a theft rate of 20.5 per 10,000 vehicles registered, those fitted with a non-AS immobiliser had a theft rate of 34.8 per 10,000 and those with no immobiliser at all had a theft rate of 32.5 per 10,000.

A further study that focused on the mandatory scheme introduced in Western Australia in 1999 also found an impact associated with the introduction of electronic vehicle immobilisation (MM Starrs Pty Ltd 2002). A regression model of the monthly number of vehicles stolen estimated that the introduction of the Western Australia scheme resulted in an eight percent reduction in vehicle theft per year. This was attributed to a reduction in temporary theft (usually associated with amateur thieves stealing for joyriding) rather than permanent theft by professional thieves.

More equivocal results were provided by Kriven and Ziersch (2007) who examined changes in the stolen vehicle age curves for vehicles stolen in 2000 and 2004. If electronic immobilisation had been responsible for the reduction, then one would have expected to observe a greater reduction in theft rates in the years following the introduction of immobilisers. Kriven and Ziersch (2007) found that there was an above average decline in theft rates following the introduction of electronic immobilisation in vehicles aged under three years. There was also some evidence of target displacement towards vehicles less likely to be immobilised in the six to nine year old bracket. However, Kriven and Ziersh (2007) also found a second wave of theft reduction among vehicles aged 10 to 13 years (well before the 2001 regulations were introduced), with evidence of displacement towards vehicles aged 19 years or older. This pattern proved more difficult to explain, with suggestions that it was due to the introduction of regulations on the re-use of Vehicle Identification Numbers following the insurance write-off of a vehicle, or due to the early introduction of immobilisers on some models in the early 1990s.

Similar results have been observed in the United Kingdom (Brown 2004; Brown & Thomas 2003; Farrell et al. 2010; Farrell, Tseloni & Tilley 2011; Lee, Wyndham & Fairman 2006; Webb, Smith & Laycock 2004) and in Germany (Bässmann 2011), where significant reductions in vehicle theft were observed following the introduction of European Union regulations requiring all new vehicles sold in Europe to be installed with electronic immobilisers from October 1998. In the United States, where there has been no regulation requiring manufacturers to install electronic immobilisers, such devices have taken longer to penetrate the vehicle fleet. However, there is also evidence to show that, where they have been installed, they have significantly reduced theft risks (Fujita & Maxfield 2012). Indeed, Brown (2013) identified 16 studies across Australia, the United Kingdom, Germany and the United States that have examined the effectiveness of electronic vehicle immobilisation, with 15 reporting a positive impact on vehicle theft.

Lessons for the regulation of products to encourage crime prevention

The evidence presented here demonstrates that electronic vehicle immobilisation has been successful as a crime prevention innovation not only in Australia, but elsewhere in the world. Further, there are eight lessons that can be learned from the way immobilisers were introduced, which may be applicable to the regulation of product design by governments to bring about crime prevention. Each of these is discussed in turn.

1. Be clear about the problem to be addressed

From the outset, it should be clear what problem the proposed design change is intended to address and how it will be addressed. For example, electronic vehicle immobilisation could not be expected to prevent vehicle crime in general. While it could be expected to have an impact on thefts of vehicles, it would not affect thefts from vehicles, attempted thefts, tampering or interfering with a vehicle, or criminal damage to a vehicle. Neither could it be expected to prevent all thefts of vehicles. Instead, immobilisation would only prevent those thefts that relied on starting a motor vehicle without the key and driving it away. It would not prevent vehicle thefts employing other modus operandi, such as obtaining the legitimate key through a burglary, car-jacking, stealing a hire car, or using a tow truck/low loader to remove the vehicle.

It is also important to understand the mechanism by which the proposed design change is expected to work (Ekblom 2012; Pawson & Tilley 1997; Tilley & Laycock 2002). In the case of electronic vehicle immobilisation, the primary mechanism is an increase in the effort associated with stealing a vehicle, thereby influencing the decision of potential car thieves to avoid stealing secured vehicles. It might also increase the risk of detection by increasing the length of time taken to start a vehicle, thereby increasing the opportunity for being caught in the act of theft. However, this is likely to be a secondary mechanism, behind increased effort. Understanding the mechanism of change associated with a design change is important not only for understanding how a reduction in the problem might be brought about, but also for understanding why such design changes might fail.

2. Decide whether government intervention through regulation is required

As noted earlier, regulation by the state should not be undertaken lightly. There are various other avenues that might be pursued with manufacturers before regulation is contemplated. For example, Ledbury et al. (2006) provide a useful general introduction to policy options that might be applied to different types of problem. From the perspective of product design and building on Clarke and Newman's (2005) eight roles of government (discussed earlier), a hierarchy of interventions similar to that proposed by Herman Goldstein (presented in Scott 2005) can be developed to provide a graduated response to demands for crime prevention in product design. These interventions are presented in Figure 1 and are ordered from least pressure exerted, which is at the bottom of the Figure, to most pressure at the top. A range of interventions are presented, including engagement with manufacturers and public awareness raising, through to more intensive policy options involving the use of government expenditure, regulation and litigation. Some of these interventions can be considered as 'carrots' in the sense that they incentivise manufacturers to take action (eg insurers offering discounts, supporting research and development efforts, tax incentives and subsidies), while others are 'sticks' in the sense that they penalise manufacturers for lack of action (eg naming and shaming, and regulation). It should be noted that the level of intervention adopted from Figure 1 will depend on the context of the specific problem and there is no expectation that all interventions would be tried. Further, progress up the hierarchy of interventions does not preclude the subsequent use of interventions lower down if circumstances change. However, there is an expectation that intervention will be graduated, commencing with light-touch approaches before proceeding to interventions that apply more pressure for change. This is important for 'climate setting', in which the conditions for future change are established. This, for example, can include shifting the underlying assumption about who is responsible for a problem, changing expectations about who should be taking action, or justifying the actions to be taken (Ekblom 2011).

The hierarchy presented in Figure 1 can be demonstrated with an example from the United Kingdom. In 1992, faced with record levels of vehicle crime, the Home Secretary at the time held a meeting with motor manufacturers to challenge them on the poor theft record of the vehicles they produced and to pressure them to improve security voluntarily. He also threatened to name and shame manufacturers who produced models with high theft rates (Laycock 2004). This resulted in the publication of the first Home Office Car Theft Index in the United Kingdom, which provided the public with information on the theft risks of each make and model of car (Houghton 1992). Regulation was subsequently introduced on a European Union-wide basis in 1995, under an EU Directive (95/56/EC). This forced manufacturers to install electronic immobilisers, without which their vehicles could not be sold in the European Union.

Experiences of engaging with vehicle manufacturers suggest that persuasion may not always be sufficient to bring about a crime prevention impact that is helpful to the general public. Legislation to regulate design changes was eventually required to ensure changes were made, but only after attempts to engage with the manufacturers and naming and shaming them for their poor security record.

3. The design change should be effective

Any design change that is made to consumer products should be effective in the sense that it reduces the problem it is intended to address in the way is it supposed to. Although this seems a truism, in practice, design changes often prove

ineffective. In the context of motor vehicle theft, there has been a myriad of security devices designed to prevent theft. These date back to the very early days of the motor car (Perry 1910), with continuous innovation throughout the twentieth century, through to the introduction of electronic immobilisation in the late 1980s. Most of these vehicle security innovations proved to be ineffective from the outset, or initially effective until vehicle thieves found the means to overcome or circumvent the technology. This is what Ekblom (1999: 29) called a process of 'co-evolution', with design changes being met by changes in modus operandi by car thieves. Steering column locks on motor vehicles are a prime example of a design change that initially proved effective, but whose crime prevention effects gradually wore off as vehicle thieves overcame the security (Mayhew, Clarke & Hough 1992; Webb 1994).

This may highlight the importance of design change as an iterative process that responds to the environment in which the product is being used. In the context of vehicle security, Southall and Ekblom (1985: 4) described this process as an 'arms race', where manufacturers stay ahead of car thieves by inventing security devices that are then subsequently defeated by thieves and the cycle recommences.

From a regulatory perspective, effective designing out of crime needs to be routinised through design standards that clearly specify the criteria that must be met for the design to be effective. This is important from a manufacturers' perspective, whereby they need to know how to achieve the necessary standard. This is particularly important where design standards are to be mandated by government and required of all manufacturers of a specific consumer product, as failure to meet the required standard could result in sanctions or blocked access to the market. Ekblom (1997) argued that such design standards should be based on performance (such as withstanding attack for a specified time), rather than fixed construction standards. This might allow for a range of solutions, rather than a single design that if compromised, could quickly be disseminated among car thieves. In the case of electronic vehicle immobilisation, the Australian Design Rule 82/00, as established under s 7 of the *Motor Vehicle Standards Act 1989*, clearly set out what was required of manufacturers. However, in recognition of the potential for vehicle security effectiveness to degrade over time, such standards should be reviewed and updated on a regular basis to take account of the process of co-evolution.

Figure 1 Hierarchy of government interventions to encourage manufacturers to incorporate crime prevention measures into consumer products

Pressure applied	Government intervention with manufacturers
High	Bringing a civil action to compel manufacturers to take responsibility for the problem
	Introducing legislation to regulate crime prevention action by manufacturers
	Providing tax incentives or subsidies to encourage manufacturers to take responsibility for the problem
	Focusing government procurement on products that incorporate the desired design change
	Supporting research and development efforts by manufacturers to find solutions to a problem
	Pressing for the creation of a new organisation to take responsibility for the problem
	Creating a climate in which security becomes a signficant feature in the purchasing decision for consumer products, thereby creating competition among manufacturers
	Naming and shaming manufacturers to raise public attention of their failure to address the problem
	Collaborating with insurers to offer discounts on secured products
	Raising public expectations that the consumer products they buy will be sufficiently secure, thereby exerting market pressure on manufacturers
	Targeted confrontational request to manufacturers to take responsibility for the problem
	Straightforward, informal request to manufacturers to take responsibility for the problem
Low	Educating manufacturers about their responsibility for a crime problem

Sources: Clarke and Newman 2005, Scott 2005.

4. The design change should be convenient for the user

The introduction of a security feature to prevent the theft of a consumer product should in no way detract from the utility of that product. As noted by Lester (2001: 5) security features should not:

- require a significant amount of additional effort to be overcome by a legitimate operator;
- malfunction so that a legitimate operator is denied use of the product;
- cause an excessive increase in product size or mass; or
- contribute to any other factors likely to make the product unattractive to a user.

In ideal circumstances, the user would be unaware that the security feature was present, with the product being protected without the need for a user to actively engage the security concerned. This form of passive crime prevention describes the way in which electronic vehicle immobilisation works, with a driver automatically engaging the security when the key is removed from the ignition. Indeed, many drivers may be unaware of whether their vehicle is fitted with an electronic immobiliser. This can be contrasted with examples of vehicle security that require the user to actively engage the security, as would be the case with a mechanical device such as a steering wheel 'club', pedal cover, or gearstick lock that

needs to be physically applied each time the vehicle is left unattended.

Unfortunately, non-passive crime prevention measures that rely on the actions of the user have proven fallible; for example, incorrect usage of a crime prevention measure or failure to employ it each time. An example of this can be found in the use of earlier forms of vehicle security. Burrows, Ekblom and Heal (1979) reported on an evaluation of a crime prevention awareness campaign in which the researchers tested the security of cars in Plymouth, England, to determine whether security behaviour improved following the campaign. This involved testing whether doors and boots were locked and windows closed for a sample of cars (each sample consisting of 1,000 cars) examined before, during and after the campaign. No difference was found in the level of car security following the campaign. Importantly, 19 percent of cars tested before the campaign and 19.2 percent of cars tested after the campaign were insecure, and in 51 percent of cases, this insecurity was due to an unlocked door. In this study, around one in 10 consumers failed to deploy even the simplest security measure (a door lock).

5. Some displacement is acceptable

A common response when situational crime prevention measures are proposed is the concern that crime will simply be displaced from one location or target to another, thereby rendering the intervention pointless. Yet numerous studies have shown that displacement is by no means inevitable and that when it does occur, displacement is partial and that diffusion of benefit (where the crime reduction gains extend beyond the anticipated target) is just as likely as displacement (Guerette & Bowers 2009; Hesseling 1994; Johnson, Guerette & Bowers 2012).

Where electronic vehicle immobilisation is concerned, Brown and Thomas (2003), Brown (2004) and Kriven and Ziersch (2007) showed that there was displacement towards older vehicles in particular. However, the overall reductions in theft outweighed the displacement effects, which were only considered to be temporary until immobilisers had been introduced through the vehicle fleet.

From the outset of implementing a particular crime prevention measure for a consumer product, it should be possible to predict where displacement might occur. It may be possible to address such displacement with alternative measures, as was the case with Lee, Wyndham and Fairman (2006) who suggested the use of mechanical immobilisers (which were cheaper than electronic immobilisers) in high-crime areas to address the increase in thefts of older vehicles resulting from the introduction of electronic immobilisers on new cars in the United Kingdom. Alternatively, potential displacement could be accepted on the grounds that the crime reduction effects would outweigh the displacement effects, recognising that the cost effectiveness of a crime prevention measure would be diminished by displacement. However, an important consideration in accepting such displacement is an assessment of who is affected by it. Ideally, the crime risk should not be shifted towards more vulnerable consumers, even if the products concerned are of lower value. Where electronic immobilisers are concerned, Brown (2004) noted that a consequence of displacement towards older vehicles was a potential increase in the vulnerability of owners of low-value cars, who were less likely to have insurance for theft and therefore less resilient to victimisation.

6. The impact of a design change can take time

When a design change is implemented on an incremental basis, such as when new products are sold, it can take years to reap the crime prevention benefit of the change. It depends on the speed with which the products with the design change penetrate the existing stock available for theft. This will, in turn, depend on the life of a given product and the rate at which it is replaced. Some products have very long lives. For example, kitchen knives are rarely replaced, while mobile phones are often replaced on an annual basis. This suggests that the quickest crime prevention gains will be made by focusing attention (at least initially) on products with a short replacement cycle. The incremental way in which electronic immobilisers were rolled out in Australia, with all new cars receiving the intervention (except in Western Australia where used cars also received immobilisers when changing ownership), meant that it took time to secure the vehicle fleet as vehicles aged. Indeed, after 10 years of implementation, over a quarter of the vehicle fleet was still unprotected by an electronic immobiliser.

7. Effectiveness needs to be monitored over the long term

The fact that crime prevention impacts can degrade over time and that displacement can diminish the benefits of crime prevention measures, highlights the importance of monitoring the effectiveness of crime prevention in the long term. This should involve empirical analysis of crime prevention measures and how they perform in the field. Crime prevention measures do not always work as anticipated and manufacturers need to be aware of approaches that may overcome or circumvent their security. This may come in the form of intelligence from law enforcement agencies regarding new modus operandi being observed, or reports from insurance companies. It may also come from analyses of theft trends at the individual product level, as is currently provided on vehicle makes and models by the CARS database on behalf of the National Motor Vehicle Theft Reduction Council in Australia. These approaches should provide an early warning to manufacturers that changes in their security systems may be required. Indeed, manufacturers should ideally be continually innovating security for their products to take account of emerging threats. Further, the security should be open to upgrades during the product's life as new security threats emerge. This would shorten the time taken to secure products currently in use.

8. The gains should outweigh the cost of regulation

Regulation clearly comes at a cost. There is a cost to the taxpayer for implementing legislative change and monitoring

compliance with regulation. For the consumer of the products in question, there is the additional cost of manufacturing a product with the required design change and complying with the regulatory requirements, which may be passed on to them through higher prices. These costs need to be weighed against the benefits the taxpayer derives in terms of reduced costs to the criminal justice system as a result of investigating and prosecuting fewer cases. There will also be benefits for the consumer in terms of reduced likelihood of victimisation and the associated costs, where the victim incurs inconvenience and replacement costs. Clearly, regulation can only be justified on economic grounds where the benefits are significantly greater than the costs imposed and where there is a failure in the market to correct the externality.

Recent research in the Netherlands by van Ours and Vollaard (2013) suggests that electronic immobilisers are indeed a cost-effective form of security. While the cost of immobilisers was estimated at 1,500 Euro per prevented car theft, the social and economic cost of a car theft was estimated to be between 5,000 and 12,000 Euro. On that basis, the benefits of electronic vehicle immobilisation would appear to outweigh its costs by a significant margin.

Transferring the lessons to other consumer products

The eight lessons described here are drawn from successful attempts to improve the security of one particularly theft-prone consumer product—the motor car. The extent to which such lessons are transferable to other consumer products will depend on a range of contextual factors. For example, the ratio of security costs to product price will be an important consideration. The lessons from motor vehicle security show that motor manufacturers are reluctant to improve security, even when the costs involved represent only a very small proportion of the overall manufacture cost. There is also the technical challenge of developing security solutions that are effective and yet do not diminish the desirability or use of the product by the consumer. Finally, there is the social desirability and demand for improved security of consumer products among the general public, especially if it can only be achieved through government regulation. As Armitage (2012) has shown, progress in designing out crime from consumer products can be slow and challenged by opposition at every stage.

Conclusion

It has been shown in this paper that, under some circumstances, where other approaches have proven ineffective, regulation can be used to bring about product design changes that can reduce crime. By examining the regulation of electronic vehicle immobilisation, introduced on to all new cars in Australia from July 2001, eight general lessons were identified, which can be applied to other consumer products that generate crime harvests (Guerette & Clarke 2003; Pease 2001). These include the need to:

- understand the problem and to articulate how design change would address it;
- ensure the design change will be effective in addressing the problem;
- ensure the change does not detract in any way from the experience of using the product;
- accept that there may be some crime displacement, but that this is likely to be both partial and temporary;
- accept that design change may take a considerable time to show an impact, depending on the product life;
- monitor the impact over the long term; and
- assess the cost-benefits of any design change.

Perhaps the most important of the eight lessons examined here is the need to decide whether regulation is required, or whether other approaches could yield the same result. Government intervention should be viewed as a graduated process that encourages voluntary action by manufacturers before compulsory changes are considered.

References

All URLs correct at February 2013

Armitage R 2012. Making a brave transition from research to reality, in Ekblom (ed), *Design against crime: Crime proofing everyday products*. Boulder: Lynne Rienner Publishers

Bässmann J 2011. Vehicle theft reduction in Germany: The long-term effectiveness of electronic immobilisation. *European Journal of Criminal Policy Research* 17: 221–246

Breyer S 1998. Typical justifications for regulation in Baldwin R, Scott C & Hood C (eds), *A reader on regulation*. Oxford: Oxford University Press: 59–92

Brown R 2013. Reviewing the effectiveness of electronic vehicle immobilisation: Evidence from four countries. *Security Journal*, advance online publication 14 January 2013; doi: 10.1057/sj.2012.55

Brown R 2004. The effectiveness of electronic immobilisation: Changing patterns of temporary and permanent theft, in Maxfield M & Clarke RV (eds), *Understanding and preventing car theft*. Crime prevention studies no 17. Cullompton Devon: Willan Publishing: 101–119

Brown R & Thomas N 2003. Aging vehicles: Evidence of the effectiveness of new car security from the Home Office Car Theft Index. *Security Journal* 16: 45–53

Burrows J, Ekblom P & Heal K 1979. Crime prevention and the police. *Home Office Research Study* no 55. London: Her Majesty's Stationery Office

Clarke RV 1999. Hot products: Understanding, anticipating and reducing demand for stolen goods. *Police Research Series* no 112. London: Home Office

Clarke RV & Newman G 2005. Modifying criminogenic products: What role for government?, in Clarke RV & Newman G (eds), *Designing out crime from products and systems*. Crime Prevention Studies. Cullompton Devon: Willan Publishing: 18

Dubourg R & Hamed J 2005. *The economic and social costs of crime against individuals and households 2003/04*. Home Office online report 30/05. London: Home Office http://webarchive.nationalarchives.gov.uk/20100413151441/http://www.homeoffice.gov.uk/rds/pdfs05/rdsolr3005.pdf

Ekblom P 2011. *Crime prevention, security and community safety using the 5Is framework*. Basingstoke: Palgrave Macmillan

Ekblom P 2012. The private sector and designing products against crime, in Welsh BC and Farrington DP (eds), *The Oxford handbook of crime prevention*. Oxford: Oxford University Press: 384–403

Ekblom P 1999. Can we make crime prevention adaptive by learning from other evolutionary struggles? *Studies on Crime and Crime Prevention* 8(1): 27–51

Ekblom P 1997. Gearing up against crime: A dynamic framework to help designers keep up with the adaptive criminal in a changing world. *International Journal of Risk, Security and Crime Prevention* 2: 249–265

Dr Rick Brown is Deputy Director (Research) with the Australian Institute of Criminology

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Tel: 02 6260 9200
Fax: 02 6260 9299

Farrell G & Roman J 2006. Crime as pollution: Proposal for market-based incentives to reduce crime externalities, in Stephens MR & Moss K (eds), *Crime reduction and the law*. London: Routledge: 135–155

Farrell G, Tseloni A, Mailley J & Tilley N 2010. The crime drop and the security hypothesis. *Journal of Research in Crime and Delinquency* 48(2): 147–175

Farrell G, Tseloni A & Tilley N 2011. The effectiveness of vehicle security devices and their role in the crime drop. *Criminology and Criminal Justice* 11(1): 21–35

Felson M & Clarke RV 1998. Opportunity makes the thief: Practical theory for crime prevention. *Police Research Series* no 98. London: Home Office

Fitzgerald J & Poynton S 2011. The changing nature of objects stolen in household burglaries. Crime and Justice Statistics, *Bureau Brief* 62. Sydney: NSW Bureau of Crime Statistics and Research

Fujita S & Maxfield M 2012. Security and the drop in car theft in the United States, in van Dijk J, Tslenoi A & Farrell G (eds), *The international crime drop: New directions in research*. London: Palgrave

Guerette RT & Bowers KJ 2009. Assessing the extent of crime displacement and diffusion of Benefits: A review of situational crime prevention evaluations. *Criminology* 47(4): 1331–1368

Guerette RT & Clarke, RV 2003. Product life cycles and crime: Automated teller machines and robbery. *Security Journal* 16: 7–18

Hesseling R 1994. Displacement: A review of the empirical literature, in Clarke RV (ed), *Crime Prevention Studies 3*. Monsey, NY: Criminal Justice Press: 197–230

Houghton G 1992. Car theft in England and Wales: The Home Office Car Theft Index. *Crime Prevention Unit Paper* 33. London: Home Office

Johnson SD, Guerette RT & Bowers KJ 2012. Crime displacement and diffusion of benefits, in Welsh BC and Farrington DP (eds), *The Oxford handbook of crime prevention*. Oxford: Oxford University Press: 337–353

Karmen AA 1981. Auto theft and corporate irresponsibility. *Contemporary Crises* 5: 63–81

Kriven S & Ziersch E 2007. New car security and shifting vehicle theft patterns in Australia. *Security Journal* 20: 111–122

Laycock G 2004. The UK Car Theft Index: An example of government leverage, in Maxfield M & Clarke RV (eds), *Understanding and preventing car theft*. Crime Prevention Studies 17. Cullompton, Devon: Willan Publishing: 25–44

Ledbury M, Miller N, Lee A, Fairman T & Clifton C 2006. *Understanding policy options*. Home Office Online Report 06/06. London: Home Office

Lee A, Wyndham T & Fairman T 2006. Reducing theft of old vehicles: Raising levels of investment in car immobilisers, in Economic and Resource Analysis (ed), *Changing behaviour to prevent crime: An incentives-based approach*. Home Office online report 05/06. London: Home Office

Lester A 2001. Crime reduction through product design. *Trends & Issues in Crime and Criminal Justice* no. 206. Canberra: Australian Institute of Criminology. http://aic.gov.au/publications/current%20series/tandi/201-220/tandi206.html

Mayhew P, Clarke R & Hough M 1992. Steering column locks and car theft, in Clarke RV (ed), *Situational crime prevention: Successful case studies*. New York: Harrow and Heston: 52–65

Mazerolle L & Ransley J 2012. Crime, place and pollution: Expanding crime reduction options through a regulatory approach. *Criminology and Public Policy* 11(2): 335–344

MM Starrs Pty Ltd 2002. *Principles for compulsory immobiliser schemes*. Melbourne: National Motor Vehicle Theft Reduction Council

National Motor Vehicle Theft Reduction Council (NMVTRC) 2011. *Disrupt, divert and build capacity: Annual report 2011*. Melbourne: National Motor Vehicle Theft Reduction Council

National Motor Vehicle Theft Reduction Council (NMVTRC) 2007. *The effectiveness of immobilisers in preventing vehicle theft in Australia*. CARS brief report, April 2007. Melbourne: National Motor Vehicle Theft Reduction Council

Newman GR 2004. Car safety and car security: An historical comparison, in Maxfield M & Clarke RV (eds), Understanding and preventing car theft. *Crime Prevention Studies* no 17. Cullompton Devon: Willan Publishing: 217–248

Pawson R & Tilley N 1997. *Realistic evaluation*. London: Sage

Pease K 2001. *Cracking crime through design*. London: Design Council

Perry HW 1910. Anti joy ride devices. *Scientific American* 15 January 1910: 49, 58 & 70

Posner RA 1974. Theories of economic regulation. *Journal of Economics and Management Science* 5(2): 335–358

Potter R & Thomas P 2001. *Engine immobilisers: How effective are they?* South Australia: National Motor Vehicle Theft Reduction Council

Rollings K 2008. *Counting the cost of crime in Australia: A 2005 update*. Research and public policy series no. 91. Canberra: Australian Institute of Criminology. http://aic.gov.au/publications/current%20series/rpp/81-99/rpp91.html

Scott M 2005. Shifting and sharing police responsibility to address public safety problems, in Tilley N (ed), *Handbook of crime prevention and community safety*. Cullompton, Devon: Willan Publishing: 385–410

Shrader-Frechette KS 1991. *Risk and rationality: Philosophical foundations for populist reforms*. Berkley and Los Angeles, California: University of California Press

Southall D & Ekblom P 1985. *Designing for vehicle security: Towards a crime free car*. Crime Prevention Unit paper no. 4. London: Home Office

Sutton M 1998. Handling stolen goods and theft: A market reduction approach. *Home Office Research Study* no. 178. London: Home Office

Tilley N & Laycock G 2002. Working out what to do: Evidence based crime reduction. *Crime Reduction Research Series* no. 11. London: Home Office

van Ours JC & Vollaard B 2013. The engine immobiliser: A non-starter for car thieves. Unpublished working paper 4 January 2013

Webb B 1994. Steering column locks and motor vehicle theft: Evaluations from three countries, in Clarke RV (ed), *Crime prevention studies 2*. Monsey, NY: Criminal Justice Press: 71–89

Webb B, Smith M & Laycock G 2004. Designing out crime through vehicle licensing and registration dystems' Theft, in Maxfield, M & Clarke RV (eds), *Understanding and preventing car theft*. Crime Prevention Studies 17. Cullompton, Devon: Willan Publishing: 67–84