

## WORKING PAPER

# An insurance based approach to safer road use

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### Abstract

A challenge in achieving safer road use is that the financial incentives for drivers and their insurers for safer road use are significantly lower than the benefits; that is, the financial consequences of a road crash fatality, and to an extent serious injury, are far less than the economic benefits of prevention.

This paper explores policy changes to address this imbalance. An insurance based solution is examined whereby insurers are given optimal incentives to encourage safer road use and related decisions. This alternative is examined in light of technology and social trends, behavioural biases of road users and the legal and policy environment. Such a solution could be efficient and effective, be cost reducing and lead to safer road use among all road users.

There are a number of issues for consideration but none appear insurmountable. There is a need to reform existing insurance schemes to facilitate usage-based insurance pricing to improve road-safety. Now that technology enables monitoring of safe driving, the current arrangements have the effect of taxing safer driving and subsidising un-safe driving.

**Keywords:** Insurance economics; usage-based insurance; innovation; road-safety incentives.

## 1 Introduction

Much has been achieved in reducing the road toll. In Australia, like many similar countries, the fatality rates are lower today than any time in the last 40 years. But the road toll is still significant; in the first decade of this century around 15,000 people were killed on Australian roads and around 300,000 hospitalised (ATC 2011, page 11).

## 2 Personal incentives for road safety

Road safety depends significantly on individual choices and behaviours. Government and authorities can only directly control the physical environment. Important factors in road safety, including the choices regarding the vehicle, when to drive and driving behaviour can be influenced but not directly controlled. This is reflected in the Safe System Approach; three of the four components of the Safe System Approach (Safe Vehicles, Safe Speeds, Safe Road Users) focus on personal decisions.

Given the importance of individual decisions, it is useful to consider the incentives for safe road use. Individuals of course have an interest in road safety to prevent injury to themselves and their loved ones and to prevent damage to their vehicles. We would expect that most individuals would also wish to avoid damage to others on the road. Society also creates additional incentives for safer road use. Governments regulate and influence vehicle choice decisions and driving choices and behaviour. Social pressure exists to use the roads safely.

However, despite these factors, the individual incentives for road safety appear light compared to the costs. The social cost of road crashes can be estimated as the amount that society would be willing to pay to avoid road crashes (Tooth 2010). On this basis, the value of preventing a random fatality in Australia is around \$6 million and in aggregate, the costs have been estimated at over \$27 billion per year (in 2006 dollars); an amount that does not incorporate the friends' and families' additional desire for safety of their loved ones (Tooth 2010). The individual bears little of this cost.

Individual incentives for safe road use to prevent harm to oneself are also lower than desirable due to a key behavioural issue. One of the strongest findings from the field of behavioural economics is that individuals, on average, are overconfident in their driving abilities and underestimate the risks to their own safety. Evidence of overconfidence with regard to driving has been found in numerous Australian and international studies.<sup>1</sup> The results of these studies are fairly consistent. It seems that on average people have reasonably good perceptions of societal risks, but that they overestimate their own driving ability and underestimate the likelihood that they will be involved in a crash.

The liability for road crashes is limited to direct costs and compensation. These can include compensation for families for loss of income and, in the case of serious injury, costs of rehabilitation and care.

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<sup>1</sup> See Sandroni and Squintani (2004) for a survey.

Drivers at fault are protected from the liability by the insurance acquired through compulsory third party insurance or through social insurance schemes. Uninsured drivers who are at fault may be liable for third party injury costs but their liability is limited by their capacity to pay.<sup>2</sup>

Given the above factors, it appears that individual incentives are lower than is optimal; that is, the ‘perceived price’ (i.e. the perceived costs incurred by individuals) for high risk driving choices and behaviour is much less than the societal costs of these actions.

Insufficient individual incentives create additional problems. The lack of individual incentives means that second best solutions may be used to help reduce the road toll. Thus in absence of sufficient individual incentives for road safety, greater expenditure is required on policing and on infrastructure to improve road safety. A further challenge is that the safer the road system, the lower the individual incentives for safe driving.<sup>3</sup>

### **3 An insurance based proposal to improve road safety**

#### **3.1 Background**

##### **3.1.1 Changes and enablers**

While insurance may have been seen as a means of diluting individual incentives, there is significant potential for large change. The issue of insurers diluting incentives for road safety exists to the extent that insurers cannot monitor behaviour.

Insurers have long provided discounts based on driving history, but many are now going further and providing incentives (discounts on premiums) based on current driving behaviour.

Technology is providing a means to achieving this. Through telematics solutions — solutions that integrate mobile computing and telecommunications — driving behaviour can be monitored. Using the technology drivers can provide insurers with evidence of their good driving to receive rewards and can get feedback for themselves on their driving performance.

There are a number of examples of how the technology has been used. The insurer Progressive uses telematics to provide a usage-based insurance product in over 30 US states based on braking speed, distance travelled and the amount of night-time driving. In the UK, an insurer, ingenie, offers telematics based insurance solely for young drivers. It provides better driving discounts based on measures of cornering, swerving, braking, speed and acceleration.

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<sup>2</sup> This is known as the ‘Judgement Proof Problem’ – see Shavell (1986).

<sup>3</sup> Another external cost relates to vehicle size. By their mere presence, heavy vehicles impose external costs on other road users (see Tooth 2010).

Thus enabled by technology, insurers are able to monitor driving decisions and provide rewards that encourage safer road use.

### 3.1.2 Breaking the link between compensation and deterrence

There is however a problem in relying on insurance to provide incentives for safer driving. The financial incentives for insurers are to reduce claims costs — not to save lives. The claims cost for insurers is significantly less (in general) than the value of preventing a road crash.

The liability borne by insurers largely comprises of:

- immediate direct costs resulting from the road crash, including property damage
- ongoing rehabilitation costs, and
- compensation for loss of income.

The value of prevention for incidents involving loss of life and/or serious injury will generally be much higher. For these human costs, the value of prevention will depend on what society would be willing to pay to reduce the risks of such an incident occurring. The estimates vary. For evaluation purposes the NSW Road Traffic Authority uses a value of preventing a fatality (commonly referred to as the value of statistical life, VSL) of around \$6 million. In contrast, the average level of compulsory third party insurance (CTP) claim involving a fatality is less than \$0.5 million.<sup>4</sup> In the case of a fatality where there are no dependents who might claim for loss of income, the total claims costs may be very small; amounting to little more than the funeral costs.

When the liability for causing an incident is less than the value of prevention, the incentives for deterrence will be insufficient. Assume, for example, that insurers could incentivise safe driving and reduce road crashes at a cost \$2 million per life saved. From a societal viewpoint the benefits would far exceed the costs, but at an average claims cost of less than \$1 million, insurers would not have sufficient financial incentive to run such a program. As can be seen using this simple example, incentives for efficient investment in deterrence will only be sufficient when liability equals the value of prevention.<sup>5</sup>

In the case of a road crash for which there are only vehicle damage costs, the value of prevention will closely match the liability to the insurer.<sup>6</sup> Thus for property damage, liability for compensation can provide an appropriate level of incentive for deterrence.

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<sup>4</sup> In Queensland the average finalised payment for ‘Maximum’ severity claims was \$200,621, around one thirtieth of the VSL (MAIC 2011, page 33).

<sup>5</sup> An implied assumption in this paper is that the level of undetected incidents involving significant injury is minor. If incidents are undetected (and thus liability not incurred) then liability for *detected* incidents would need to be greater to create incentives for efficient investment in deterrence.

<sup>6</sup> There will be slight differences for a number of reasons. There are a number of public costs that are not borne by the insurer such as the costs associated with emergency services,

In Australia, there is another issue. The incentive and ability of insurers to help manage road safety risks is limited by regulation. In all Australian jurisdictions, CTP insurers are prevented from cost reflective pricing of individual risks. In most jurisdictions pricing is regulated such that policyholders pay an identical price regardless of their individual risk profile and thus insurers are prevented from providing discounts for safer driving. In NSW regulation some risk based pricing is possible, however an insurer can only provide at most a 15 per cent benefit to lower risk drivers. In NSW, like other jurisdictions pricing aims to be, in aggregate, cost reflective. Thus to the extent that risky driving choices can be monitored by insurers, such regulations have the effect of taxing safe driving and subsidising risky driving choices.

## **3.2 Proposal**

A simple (in principle) change to address the lack of incentives would be to levy third party insurers a charge which reflects the value of prevention over and above the current claims liability. Such a change would then give insurers incentive to achieve an efficient level investment in deterrence of road crashes.

While simple in principle, there are a number of issues and implications. Most significantly the proposal would involve:

- modification to third party insurance schemes to ensure insurers have pricing flexibility and that insurance is compulsory obtained by all drivers
- redistribution of revenue collected by the levy, and
- potential changes to compensation arrangements

### **3.2.1 Modifications to third party insurance**

The proposal relies on a competitive CTP scheme in which insurers have pricing flexibility. This would involve a significant change in Australia where in many cases CTP insurance is provided by a single insurer and, as noted above, pricing is currently regulated.

The proposal would result in a significant increase in CTP insurance premiums and thus increase the incentive for people to drive uninsured. As such, monitoring of uninsured (and unregistered) vehicles may need to be strengthened. Again technology is helping in this regard — technologies such as number plate reading technology make it increasingly difficult for anyone to drive and unregistered and thus uninsured vehicle.

### **3.2.2 Redistribution of revenue collected by the levy**

The proposal would result in substantial additional funds collected from insurers. From an economic efficiency viewpoint there is no clear use for these funds. From the viewpoint of encouraging acceptance of the proposal, the funds might be best used to reduce other on-road costs. For example, the funds collected could be used as a lump-sum subsidy to insurance premiums

and/or vehicle registration costs. As illustrated further below, if the amounts were redistributed towards road-use then the average financial on-road costs of driving may be reduced.

### **3.2.3 Changes to compensation arrangements**

The proposal could be coupled with a simplification and improvement of compensation arrangements. A potential simplification is that compensation to victims is provided through a social insurance program coupled with first party insurance arrangements. Once appropriate incentives for deterrence are established, there is little benefit of linking compensation to a legal process. It is less expensive and simpler to have pre-determined first party insurance. In the interests of equity, a social insurance program can be provided whereby all Australians have some level of first party insurance in the event of major incident. Also, in the interests of efficiency it is desirable that people can purchase supplementary first party insurance. Such an approach is consistent with the National Injury Insurance Scheme (NIIS) that is being proposed in Australia (Productivity Commission 2011, Chapter 18).

## **4 Issues and discussion**

### **4.1 Benefits and costs**

#### **4.1.1 Could insurers reduce the road toll?**

The benefits of the proposal stem from an insurer's ability to influence road safety. If insurers are unable to influence road safety decisions and behaviours then the proposal would not affect road safety. Insurers might still invest in technology and programs as there would be benefits to individual insurers of being able to identify safer (i.e. less costly to insure) drivers.

With the change in incentives, insurers may help to improve road safety through a number of strategies. First, they would have incentives to provide discounted premiums to encourage their insured to drive safer and less aggressive vehicles.<sup>7</sup> Thus vehicles which are less likely to cause damage would become relatively more attractive as the on-road costs would reduce. The discounts for safer/less aggressive vehicles would be relatively more significant for those who are at higher risk – that is the proposal would provide incentives to shift high risk drivers (e.g. young drivers) towards safer/less aggressive vehicles.

Second, they may provide premium discounts for safer driving. There are a range of options of how this might be achieved. For example, insurers may provide discounts for:

- better driving behaviour based on data collected from the car on-board diagnostics (OBD)
- less frequent driving based on manual odometer readings, and
- participating in safe-driving programs.

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<sup>7</sup> The increased incentives for safer vehicles will depend on how the proposal is implemented. There are arguments for and against a levy being applied for injury to the at-fault driver.

Third, they may undertake non-financial programs such as educational campaigns to encourage better driving and promoting safer road used (e.g. through the use of safe driving agreements).

There is evidence that insurers can modify behaviour. Greaves and Fifer (2010) ran a controlled trial involving in-car technology that tracked vehicle movement. They found that in response to financial incentives people drove less and were less likely to speed. There is also increasing evidence from insurers using telematics solutions. A UK insurer, insurethebox, tracked driving improvement among their customers. They found significant reduction in accident rates particularly among young drivers (insurethebox 2012). After controlling for normal improvement in young drivers (as they gain more experience) they estimate the effect of telematics was to reduce the rate of accidents involving young motorists (drivers aged 17 to 21) by 35 percent to 40 percent.

The incentives for change would be of significant magnitude to encourage innovation by insurers to improve road safety. The additional financial consequences for insurers would be very large. For example, if insurers were levied \$6 million per fatality and this applied to 500 third party fatalities per year then the additional costs to insurers for fatalities would be in the order of \$3 billion. With a similar cost relating to serious injuries the additional claims cost for insurers would be in the order of \$5 billion per year. In comparison, the current claims cost across all motor classes (CTP, Domestic and Commercial) is in the order of \$7.5 billion/year and the total net profit before tax across these classes is <\$2.5 billion.<sup>8</sup> Of note, if insurers can modify driver behaviour, then the estimate of \$5 billion per year also reflects the extent to which unsafe driving is currently under-priced (i.e. subsidised).

#### **4.1.2 Additional benefits**

There would be additional benefits associated with these schemes. First, the introduction of insurance based monitoring may allow a lower expenditure on other road-safety measures. For example, insurance based monitoring may enable a reduction in policing costs while still improving road safety.

Second, the devices and technology used have ancillary benefits for users. Most notably the technology is often coupled with theft prevention benefits.

Finally, there are possibly additional social benefits from changes in road-use. For example, usage-based road pricing may lead to an overall reduction in driving which may help to ease congestion costs and reduce other environmental costs (e.g. noise and air pollutants) associated with driving.

#### **4.1.3 Costs**

The most significant costs associated with the proposal are likely to be the cost of programs run by insurers, which are likely to be most significantly associated with telematics based insurance. The costs of the technology are significant but are falling. An Australian company, betterdriver (see

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<sup>8</sup> Source: APRA (2012).

[www.betterdriver.com](http://www.betterdriver.com)), currently provides a telematics based solution \$700 for a 12 month period.<sup>9</sup> With greater scale the costs would likely fall. A more reasonable estimate<sup>10</sup> in the medium term for a solution with greater scale is \$500 per year.

There would be additional administration costs of the reform; however these would appear to be relatively light. For example, there would be some additional administration costs associated with road crashes for which there is a fatality and/or serious injury.

There are also other personal costs to such solutions. These include any customer inconvenience associated (including privacy concerns) with having a telematics device installed in their vehicle.

#### **4.1.4 The net impact of the proposal**

There are a number of considerations in assessing the net impact. The net impact of the proposal can be indicatively estimated in terms of the cost per injury prevented or a dollar basis. A per dollar basis is simpler, as it is a single measure across all injury severity classes.

The significance of costs and benefits will depend on the roll-out of programs. A telematics usage-based insurance program provides a useful benchmark case. In a competitive market, drivers would only participate in such programs if they felt the benefits exceeded the costs. Not all drivers would wish to opt-in. Ancillary benefits and costs aside, the benefits may be low for older drivers with a good driving record. The solution is likely to be taken-up by young drivers who can demonstrate that they can drive more safely and older drivers who have a poor driving record. Once penetration of usage based pricing increases in an identifiable group (e.g. young drivers), the insurance premiums for those opting out would increase if opting-out is interpreted as a signal to insurers that they are relatively higher risk.

There is also a question of what is the appropriate baseline (i.e. counterfactual). Usage-based insurance programs are already being offered. Furthermore, with regards to Australia, the proposal is, in effect, for two insurance reforms: first, a removal of price restrictions on CTP insurance; and second a modification of CTP insurance pricing to reflect the value of prevention. For the purposes of an illustrative assessment, it is assumed that the comparison is between the current system (with negligible take-up of usage-based insurance) and the full proposal.

In consideration of these issues an assessment of the net cost-benefit can be developed based on a roll-out to a large proportion of young drivers only. While this is not realistic, as there will be a variety of penetration across age groups, it nevertheless provides an illustrative guide. Assume that:

- A telematics insurance solution is rolled-out to two-thirds of drivers in the age-group 17 to 25. Based on a total of 16.5 million licensed vehicles in Australia ABS (2011) the total take-up rate would be around 10 percent or 1.6 million vehicles.<sup>11</sup>

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<sup>9</sup> Drivers who take up the program receive a 20 percent discount on their car insurance with the insurer AAMI.

<sup>10</sup> Based on personal correspondence.



- The average crash reduction is 40% in this 17 to 25 age-group. This is comparable to the results achieved in the UK noted above.<sup>12</sup> Based on NSW crash data,<sup>13</sup> the crash rates would still be higher in this age group than in the 26 to 49 age-group.
- The cost of the program is \$500 per year per licensed vehicle.
- The financial costs of road accidents and the total social costs of road accidents is \$12 billion and \$30 billion per year respectively<sup>14</sup> and that the cost per accident is constant across age groups.

Based on these set of assumptions, the total crash rate would fall by around 7%. If levies collected from insurers were returned to the road system, total on-road financial costs would also fall as the financial costs of the program (estimated in total at around \$0.8 billion per year) would be less than the financial costs associated<sup>15</sup> with the avoided road crashes (estimated at around \$0.85 billion). When the full costs of prevention are considered the net-benefits would be in the order of \$1.4 billion.

The results are largely scalable. A greater (lower) penetration rate would increase (decrease) the benefits and costs in similar proportion. The additional benefits of any single driver adopting usage-based insurance depend on the extent to which the premium discounts the driver receives reflect a change in behaviour or merely signals existing safe driving habits.

These results are illustrative only. Only the most significant benefits and costs associated with usage-based pricing are considered.<sup>16</sup> However the results indicate that potentially substantial road safety benefits can be achieved while lowering on-road costs.

## 4.2 Alternatives to the insurance based approaches

Alternatives to the approach are possible. In theory, one alternative is for government to undertake similar activities to insurers to reduce the road toll. However insurers have some significant advantages over governments. Insurers can more flexibly trial different programs. Whereas privacy concerns would prevent governments collecting information on driving behaviour, people willingly

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<sup>11</sup> Licensed vehicles by age are extrapolated from NSW statistics found in MAA (2011).

<sup>12</sup> There are arguments for why the crash-reduction rate may be higher or lower than that experienced by insurers in the UK. A higher crash reduction rate would be expected as the financial incentives under the proposal would be more significant than that provided in the UK. Conversely given a broader roll-out to a wider age-group the average crash reduction rate would be presumably lower than has been experience for new drivers.

<sup>13</sup> The NSW Motor Accidents Authority (MAA) annual report (MAA 2011, page 81) includes data on causes of crashes by age group. It also includes proportions of licence holding by age group.

<sup>14</sup> These amounts are taken from Tooth (2010) for the year 2006 and inflated to the year 2012.

<sup>15</sup> That is those costs not including the people's willingness to pay to avoid accidents.

<sup>16</sup> Other key benefits not evaluated are the impacts of other programs insurers may adopt, the positive impact of vehicle choice, and potential efficiencies in policing and compensation management.

offer information to insurers to get lower insurance premiums. Importantly, with the right incentives insurers would compete to innovate and find the best programs.

An alternative to charging a levy would be to allow punitive damages. However such an approach is relatively unattractive. The core benefit of a punitive damage approach is that it allows for flexible levels of payment that determine compensation and deterrence. However, compensation for a loss is better determined ex-ante by individuals. Relying on ex-post compensation requires people to use the legal process to obtain compensation — this can be expensive and time consuming and undesirable for many victims. From the viewpoint of deterrence, punitive damages have little benefit and have disadvantages. The deterrence value is dependent on victims undertaking legal action — which may not be possible for some cases (e.g. in the case of a fatality) and undesirable to others. Punitive damage outcomes would also increase the uncertainty for insurers.

### **4.3 Other issues and implications**

#### **4.3.1 Issues to managed**

Issues to be considered would include:

- How to manage differences across jurisdictions (e.g. in the size of the levy). This is a current challenge that may be accentuated by the proposal.
- Setting and administering the levies. Government bodies would be required to set and administer the levies. There is currently relatively limited research on the value of preventing a serious injury. There will be some issues that need to be debated – for example, there are arguments for and against as to whether a levy should apply for death/injury to the driver at fault.
- Potential wealth transfers. While the proposal aims to lower the overall costs of driving, the proposal could involve a substantial change in the insurance paid by different groups.
- Privacy concerns. Some parties may be concerned at the privacy implications of insurance based monitoring of driving. To date this has not been a significant issue due to the opt-in nature of the program.

#### **4.3.2 Implications**

There are a number of implications for different parties. This would include:

- For CTP insurers: CTP insurers would be incentivised to invest in road safety measures. CTP insurance would become less of a commodity product.
- For prudential regulation. There are two implications for regulators assessing the prudential standing of an insurer. First, the average CTP claims cost would increase and thus increase year on year variability over claims. However future uncertainty over claims costs would decrease as the total claims cost would be realised within a short-time after the incident.
- For vehicle sales: The on-road costs for different vehicles would change.
- For policing: Potentially there could be a change in the role policing has in road safety.

- For the legal system: There would be a reduction in the use of the legal process for compensation claims.

#### 4.4 Pathways to reform

Managing the reform process would be important. Given the substantial costs involved some adjustment process would be necessary to enable time for stakeholders (in particular insurers) to manage the change.

Gradual reform options are possible. For example, steps may include:

- Deregulation of CTP pricing (to enable competitive usage based pricing)
- Introduction of levies for freight-based traffic (prior to non-freight road traffic)
- Gradual increase in levies – For example, the levies might be increased over a number of years from zero (effectively what currently occurs) to the full amount

### 5 Conclusion and further research

An insurance based solution involving appropriate financial incentives for safe road use has significant potential to provide substantial benefits to all road users. Available evidence suggests the benefits are potentially very large and may reduce on-road financial costs for drivers; that is, road-safety may be improved at a reduced financial cost.

There are a number of issues for consideration but none appear insurmountable. This paper highlights the need to reform existing CTP insurance schemes to facilitate usage-based insurance pricing to improve road-safety. Now that technology enables monitoring of safe driving, the current system has the effect of taxing safer driving and subsidising un-safe driving.

There are a number of priorities for research and analysis. There are many design and implementation issues to be fleshed-out. The attractiveness of the proposal depends significantly on the extent of benefits from insurers being able to influence decisions and driving behaviour.

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