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No-fault compensation schemes for self-driving vehicles

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ABSTRACT
'Who is liable if an accident happens with a self-driving vehicle?' This question is often raised, but perhaps it can be made redundant. This article shows how so-called no-fault-compensation schemes (NFCS) can take over functions traditionally performed by liability schemes in the realm of self-driving vehicles. At the same time, it is highlighted that there is no such thing as 'the' NFCS'. NFCS come in many shapes and forms. The article elicits the main choices that NFCS raise and the policy implications they entail.

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KEYWORDS No-fault compensation scheme; liability; prevention; insurance; self-driving vehicle

1. Introduction

A number of countries have so-called no-fault compensation schemes (NFCS) for dealing with losses resulting from road accidents. A victim can claim compensation without the need to establish that somebody else is responsible for the accident or losses. NFCS were developed in the 1960s and 1970s to overcome shortcomings of tort systems as a means for dealing with harms resulting from road accidents. Victims had great difficulty in obtaining compensation in the tort system, it took a long time before compensatory payments were made and the distribution of compensation across victims was unequal. Many victims did not succeed in obtaining any compensation (for example, because the defendant was not insured or because contributory negligence was an absolute bar to liability) while others obtained very generous compensation.[1] NFCS were set up in

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[1] Stephen Sugarman, 'Quebec's Comprehensive Auto No-Fault Scheme and the Failure of Any of the United States to Follow' (1998) 39 C. de D. 303.

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various jurisdictions to help protect victims and to lessen the burden road accident cases put on the court system.[2]

Self-driving vehicles bring profound changes that impact road accident liability and insurance. This article explores whether NFCS have merit if applied to accidents with self-driving vehicles and what the main policy choices are when implementing such schemes in the EU. This is not to suggest that NFCS are the only possible approach to the challenges of self-driving vehicles, but this article limits itself to these schemes.

Drawing inspiration from NFCS for victims of road accidents that are already in place in a number of jurisdictions, this article sketches what a NFCS might look like when applied to automated vehicles. In this way, it seeks to set the context for a more fruitful discussion about the compensatory regime applicable to road accidents with automated vehicles. Of course, not all questions regarding NFCS in relation to automated vehicles can be answered, partly because there are many ways in which a NFCS for automated vehicles could be realised, and partly because it raises many new law-and-economics questions to which in this early stage of discussion no answers exist.

In order to establish whether a NFCS has merit, three elements are considered: victim protection, prevention and innovation.

1.1. Victim protection

In road accident liability law, victim protection has played a large role for a long time. Road accidents often have such grave financial consequences for victims that they cannot very well bear them. With the gradual decline of the welfare state, road accident liability law has increasingly functioned as a means to provide victims with compensation.[3] This was mainly realised through (mandatory) insurance and funds from which victims of uninsured drivers could be compensated and by whittling down defences that insured drivers could bring forward. In this article, it is assumed that the needs of victims of self-driving vehicles do not differ markedly from the needs of those who are victims of accidents with human driven vehicles. The interest of victims to obtain adequate compensation is as relevant with respect to self-driving vehicles as it has been in the past.[4]

[2]For an overview, see RH Joost, *Automobile Insurance and No-Fault Law* (Clark-Boardman-Callaghan, 2nd edn 1992).

[3]Compare Michael Faure and Ton Hartlief, Nieuwe risico's en vragen van aansprakelijkheid en verzekering (Serie Recht en Praktijk, Kluwer, 2002) 90–91.

[4]The needs of victims other than compensation, such as for example the need to air grievances and be heard, are not dealt with in this article. See Tracy Pearl, 'Compensation at the Crossroads: Autonomous Vehicles and Alternative Victim Compensation Schemes' (2018) 60 *William and Mary Law Review* (forthcoming), Section II B 2.

1.2. Prevention

The prospect of being held liable, or more generally the prospect of having to internalise the costs of accidents, can act as an incentive for those who can take preventive measures to do so. In the context of self-driving vehicles, this concerns foremost manufacturers of vehicles and in their wake their suppliers. It is also relevant for managers and suppliers of roadside equipment. The relevance of internalisation of costs is sometimes disputed. It is argued that manufacturers will not deliver unsafe vehicles out of concern for their reputation. Also government agencies watch over the roadworthiness of vehicles. Such argumentation may also be welcomed by (national) governments who want to present themselves as attractive venues for manufacturers to do research and development work related to self-driving vehicles. Nonetheless, prevention is included in this article. The Dieselgate scandal suggests that governments are not necessarily very good at checking the quality of commercial products and software in particular. Self-driving is too a large extent a software innovation. It is therefore premature to dismiss the role of economic incentives of liability or compensation schemes for prevention.

1.3. Innovation

The prospect of being held liable, or more generally the prospect of having to internalise the costs of accidents, can act as a brake on innovation in the field of self-driving vehicles, especially if the implications of internalisation and damage to reputation are particularly severe.[5] In this sense, innovation is the opposite side of the prevention-coin. However, preventive measures in themselves can also be forms of innovation. In this sense, innovation goes hand-in-hand with prevention. Here we will look only at the first mentioned aspect of innovation.

1.4. Roadmap

This article proceeds as follows. The first section addresses why a NFCS is considered for application to self-driving vehicles. In the second section, the concept of a NFCS will be elaborated. An example of a NFCS, the scheme in force in Quebec, will be described. The third section highlights a number of modalities of NFCS that may be considered when implementing such compensatory regimes. They represent policy choices that need to be made when implementing a NFCS for self-driving vehicles. The fourth section explores the implications of the policy choices identified in the third section.

[5]Maurice Schellekens, 'Self-Driving Cars and the Chilling Effect of Liability Law' (2015) 31 *CLSR* 506.

2. Why consider no-fault compensation schemes for self-driving?

Damage as a consequence of road accident liability is in most European countries dealt with under a strict liability regime. With the exception of the UK – where road accident liability is dealt with under a with-fault regime – the owner or driver is strictly liable. He has limited defences. A victim can often claim directly from the liable owner's or driver's insurer. This system could also be applied for automated vehicles. However, a strict or with-fault liability scheme has a number of drawbacks.

Under a liability scheme, there always has to be a party that can be held liable. For example, a human driver cannot claim in case of a one-sided accident, assuming the condition of the road is not the cause. Under a NFCS, a driver can claim. It may be argued that for automated vehicles this traditional difference between liability and NFCS becomes less relevant. The driver, or perhaps better the user, of the automated vehicle may be able to bring a product liability claim against the manufacturer in case of a one-sided accident caused by the driving automation.

That said, in the EU, there are not many cases about product liability.[6] It is not clear why product liability is relatively unpopular with claimants. It appears therefore risky to make victims of road accidents with self-driving cars dependent upon an 'unpopular' legal action. From a victim protection perspective, there is a risk that compensation may be more difficult to obtain than with a simple claim under a NFCS. This point is also illustrated by the Automated and Electric Vehicles Act 2018 in the UK.[7] Under the with-fault road accident liability scheme in place in the UK, the government

[6]Piotr Machnikowski, *European Product Liability. An Analysis of the State of the Art in the Era of New Technologies* (Intersentia 2016) contains country reports about the application of product liability laws in various countries. This concerns product liability in all domains, not just the transport sector. The following picture emerges. Few cases in: Czech Republic (L. Tichy, p. 154), Denmark (M-L. Holle and P. Mogelvang-hansen, p. 171), England and Wales (K. Oliphant and V. Wilcox, p. 203), Italy (G. Comande, p. 307), Netherlands (A.L.M. Keirse, p. 355), Norway (B. Askeland, p. 375), Poland (E. Baginska, p. 404), Switzerland (B. Winiger, p. 477), Israel (I. Gilead, p. 544), and South Africa (J. Neethling, p. 573). Not few and not many cases: France (J-S. Borghetti, p. 235). Many cases in: Austria (B.A. Koch, p. 146), and Germany (U. Magnus, p. 272). No information about the frequency of cases in: Spain, Quebec and the US. Annette Hughes and Rod Freeman (eds.) *Product Liability. Jurisdictional comparisons*, (European Lawyer Reference Series, Thomson Reuters 2014) also contains country reports. Information about the frequency of cases was not systematically collected. Hughes and Freeman do cover some EU jurisdictions not dealt with by Machnikowski. In Croatia, the product liability directive was only implemented in 2005 (Ilicic and Bogdanovic, p. 93). For Greece, the most important developments took place in the bordering field of consumer law (Emvalomenos and Granatidis, p. 179–80). In Portugal, few class action lawsuits take place (Reis and Marcondes, p. 279). In the Republic of Ireland, there are no developing or emerging trends in product liability law (Foley, Clayton and Breatnach, p. 295). In Sweden, there has been little legal development since the introduction of a product liability act in 1992 (Norelid, Holm and Seemann, p. 319).

[7]Automated vehicles are in this Act defined as vehicles that are so listed by the Secretary of State. Vehicles eligible to be listed are designed or adapted to be capable, in at least some circumstances or situations, of safely driving themselves, and they may lawfully be so used on roads or other public places in Great Britain.

thought that fair and quick compensation[8] of victims of accidents with automated vehicles was not sufficiently ensured, even though the government took into account that a victim could hold the manufacturer liable.[9] Hence, under the new Act, an insurer is liable for damage, where '(a) an accident is caused by an automated vehicle when driving itself on a road or other public place in Great Britain, (b) the vehicle is insured at the time of the accident, and (c) an insured person or any other person suffers damage as a result of the accident'.[10] This rule makes no reference to the responsibility or liability of the 'driver' or manufacturer;[11] in this respect, it basically is a NFCS. Moreover, an insurer is liable to pay compensation to a 'driver' who has legitimately handed control to the vehicle.[12] So, we can observe that at least in the UK, victim protection is seen as an argument to introduce a regime with strong NFCS traits.

Another drawback with the application of a traditional road accident liability scheme to automated vehicles is that the manufacturer stays out of sight. The owner takes out insurance and a victim is compensated by the insurer. With human driven vehicles, it is no problem that the manufacturer is not involved. About 94% of accidents are caused by human failures.[13] However, with automated vehicles, the percentage of accidents in which the vehicle is the – or at least a relevant – cause will increase as the vehicle takes over driving responsibilities. Then it becomes relevant that the manufacturer at least should feel (part of) the economic consequences of an accident as an extra stimulus to design and build safer vehicles. A counterargument against this position may be that manufacturers already do not produce unsafe vehicles out of concern for their reputation and that there is governmental oversight. However, as already noted, the Dieselgate scandal has severely weakened this counterargument; and, even though Dieselgate

[8]Victim protection in the sense of securing compensation for victims of road accidents has already for decades been an important driver for development of the law. See for example *Nettleship v Weston* [1971] 2 Q.B. 691, Lord Denning M.R., Salmon and Megaw L.JJ, at 699–700: 'The high standard thus imposed by the judges is, I believe, largely the result of the policy of the Road Traffic Acts. Parliament requires every driver to be insured against third party risks. The reason is so that a person injured by a motor car should not be left to bear the loss on his own, but should be compensated out of the insurance fund. The fund is better able to bear it than he can. But the injured person is only able to recover if the driver is liable in law. So the judges see to it that he is liable, unless he can prove care and skill of a high standard: see *The Merchant Prince* [1892] P. 179 and *Henderson v. Henry E. Jenkins & Sons* [1970] A.C. 282. Thus we are, in this branch of the law, moving away from the concept: 'No liability without fault'. We are beginning to apply the test: 'On whom should the risk fall?' Morally the learner driver is not at fault; but legally she is liable to be because she is insured and the risk should fall on her'.

[9]See Explanatory Notes relating to the Automated and Electric Vehicles Bill as introduced in the House of Commons on 18 October 2017 (Bill 112), Part 1, Chapter 1: Policy Background, at 12.

[10]Section 2(1) Automated and Electric Vehicles Act 2018.

[11]Compare for example Section 145(3)(a) Road Traffic Act 1988 that explicitly mentions insurance 'in respect of any liability which may be incurred by him or them in respect of the death of or bodily injury to any person or damage to property caused by, or arising out of, the use of the vehicle on a road or other public place in Great Britain'.

[12]Explanatory Notes (n 9) at 17.

[13]SWOV-Factsheet, Algemene periodieke keuring (apk) van voertuigen (SWOV 2012) in Dutch only.

concerned environmental protection and not road safety its occurrence is relevant. It concerned the very industry that is the topic of this article and it shows how the opacity of software can frustrate governmental oversight. Governments struggle to understand how software exactly functions. Vehicle automation is to a large extent a software innovation. The question is whether governments will be able to adequately monitor what is being laid down in software for driving automation. Driving automation is moreover based on AI and the type of AI used is already more difficult to understand than normal command-based programs. Another counterargument may be that a manufacturer is not necessarily spared under a traditional strict or with fault road accident liability scheme. An insurer who pays compensatory damage to victims may claim against a manufacturer, on the basis of either subrogation or a statutory right. However, the possibilities to recover from the responsible party are often limited.[14] Insurers would also have to build up expertise in product liability disputes regarding automated vehicles. Also compassion with the victim does not play a role in such cases as the redress-taking insurer is as experienced or powerful as the manufacturer.[15] These factors diminish incentives to seek redress against those ultimately responsible for damage or compromise the success of redress.

Since the road accident liability regimes (strict or with fault) do exhibit some limitations – especially in the context of victim compensation and prevention – when applied to automated vehicles, it is worthwhile to look further, such as in casu at NFCS.

3. What is a no-fault compensation scheme?

A NFCS provides compensation without the need to find a responsible defendant and without proof of negligence and subsequent causality[16] A NFCS often limits or excludes recourse to tort.[17] Usually, an insurer is responsible for providing compensation. From an insurance perspective, it is not an insurance against liability, but an insurance that pays out if and when a defined, uncertain factual event occurs. The insurance is neutral towards the cause of the occurrence of the event and contributory negligence is generally not relevant.[18] Often a victim does not have a right to compensation in respect of all

[14]Section 5(1) of the Automated and Electric Vehicles Act 2018 premises recovery from the responsible person on his liability towards the victim, whereas section 2(1) of the Act does not make the insurer's liability towards the victim dependent on liability of the responsible person.

[15]Faure and Hartlief (n 3) 94.

[16]Peter Cane, *Atiyah's Accidents, Compensation and the Law* (7th edn) (Oxford University Press, 2010) 467–68.

[17]Joost (n 2) Introduction, 1. Cane (n 16) 465 does not explicitly limit or exclude recourse to tort.

[18]Faure and Hartlief (n 3) 12.

his harm, but is limited to an amount fixed in advance in law. This will be the starting point for this article.

NFCS for automobile accidents are already in place in many countries such as Israel, New Zealand, Quebec and Sweden.[19] In yet another group of countries, a combination of no-fault schemes and a tort system are in place. These include many US States.[20] Such schemes are also in place in a number of states, territories and provinces of Australia and Canada.[21] Currently, they are applied in relation to human-driven cars. There are many smaller and bigger differences between the schemes in these jurisdictions. For present purposes, the scheme adopted in Quebec will be described as an example. By excluding recourse to a tort claim for bodily harm, it is a pure implementation of the idea of a NFCS.

3.1. The no-fault compensation scheme of Quebec

In 1978, the Canadian province of Quebec introduced legislation that created a NFCS for harms resulting from the use of road vehicles.[22] The main characteristics of the scheme are that it makes a strict distinction between the compensation for bodily injury and for material losses, it abandons fault as the ground for responsibility, it allows for very limited recourse to courts, and it provides financial security.[23] The scheme only provides compensation for bodily injury, not for material losses. According to article 2 Loi sur l'Assurance Automobile, 'bodily injury' is any bodily or psychological injury to a victim including death, which is caused to him in an accident, as well as damage to the clothing worn by the victim.[24] Material losses, other than the clothing worn by the victim, are governed by a traditional with-fault tort regime, albeit with a presumption of negligence. For bodily injury, the victim need only establish that he falls within the conditions for application of the scheme. He is not obliged to show that somebody else carries responsibility for the accident or the harm.[25] As already noted, the victim is denied recourse in tort; and recourse to courts has almost completely been abandoned.[26] A victim can only claim under the administrative system with the 'Société de l' assurance automobile du Quebec' (Société). Under this

[19]Joost (n 2), Chapter 7 Jurisdictions with Pure No-Fault Insurance.
[20]According to Joost (n 2) in: Arkansas, Delaware, District of Columbia, Maryland, New Hampshire, Oregon, South Dakota, Texas, Virginia, Washington, and Wisconsin.
[21]Joost (n 2), Chapter 5 Jurisdictions with Add-on Insurance Laws. Please note that there are also jurisdictions with threshold no-fault insurance laws (See Chapter 6).
[22]Loi sur l'assurance automobile, L.R.Q.
[23]Jean-Louis Baudouin, *La responsabilité civile* (4e edn, Les Editions Yvon Blais, 1994) 463–66.
[24]Unofficial translation of: '«préjudice corporel» : tout préjudice corporel d'ordre physique ou psychique d'une victime y compris le décès, qui lui est causé dans un accident, ainsi que les dommages aux vêtements que porte la victime'.
[25]Art. 5 Loi sur l'Assurance Automobile.
[26]Art. 83.57 Loi sur l'Assurance Automobile and subsequent articles.

system, the victim can claim fixed amounts, which may not represent the totality of the bodily injuries suffered by the victim. Nevertheless, the Quebec scheme is generally perceived as quite generous.[27] The system does provide financial security of indemnification. The public status of the Société guarantees its solvability. Automobile owners pay yearly contributions to the Société in accordance with the applicable tariffs. The Société also pays indemnification for material losses (and in exceptional cases for bodily injury) in case the responsible person is not solvent. This may, for example, be relevant if a resident of Quebec is involved in an accident outside Quebec.

3.1.1. Who can claim compensation for bodily injury under the scheme?

The scheme covers practically every person who is involved in an automobile accident: the owner, the driver, the passenger, the pedestrian and drivers of non-automobile vehicles such as a bicycle. The driver and passengers of another automobile involved in an accident can claim under their own insurance. In addition, certain persons can claim compensation in case of decease.[28]

The law is limited to automobiles, which are basically all vehicles that move under other than muscular force, that are adapted for transport on public roads and do not ride on rails.[29] In general, the courts apply a broad interpretation of the notion of an automobile.[30]

There needs to be a causal link between the accident and the harm. From the case law, it can be deduced, that the courts are easily satisfied that an accident was caused by an automobile.[31] Even a car dropping suddenly upon a person who was under it for repair was considered under the scheme.[32]

The law mentions three exceptions to the application of the scheme. First, harm caused by an independently functioning apparatus is excluded. This concerns, for example, harm caused by a crane or winch mounted on a truck. Secondly, harm is excluded that is caused by non-automobile vehicles outside a public road. An example is the harm caused by a dune-buggy on a beach. A dune-buggy is not an automobile because it is not adapted for use on a public road and the beach in question was not a public road.[33] Third, accidents are excluded that happen as a consequence of a competition, a spectacle or a race on a closed circuit.[34]

[27] Joost (n 2), Section 7.5, p. 12.
[28] Baudouin (n 23) 468–69.
[29] Art. 1 Loi sur l'Assurance Automobile.
[30] Baudouin (n 23) 471.
[31] Ibid 472–74.
[32] St. Laurent c. Noel J.E. 82-593 (C.S.).
[33] Roy c. Caron [1983] C.S. 567.
[34] Art. 10 Loi sur l'Assurance Automobile.

3.1.2. The territorial application of the scheme

The legal regime addresses both accidents occurring within Quebec, involving foreign motorists and accidents occurring outside Quebec involving residents of Quebec.

3.1.2.1. Accidents occurring within Quebec. The scheme gives a claim to compensation to any resident of Quebec and persons falling under his 'charge' (articles 7 and 8 Loi). The owner, driver and passenger of a vehicle licensed in Quebec are presumed residents. There is also compensation for non-residents. A non-resident has a right to compensation if he is not responsible for the accident (fault-based). The Société will render a decision about the degree of contribution of the claimant to the damage. If the claimant and Société disagree about the degree, the dispute will be submitted to a court.[35] If the non-resident comes from a country or territory that has signed an agreement with the Société, the compensation is governed by that agreement.[36] If a non-resident is responsible for an accident within Quebec and the Société compensates the victims, then the Société is subrogated to the claims of the victims and can recover compensation from the non-resident or his insurer.[37]

3.1.2.2. Accidents taking place outside Quebec. A resident of Quebec can claim from the Société for an accident occurring outside Quebec. On top of that he can claim from the person responsible for the accident under the laws prevailing in the jurisdiction where the accident occurred, typically only for harm that has not been compensated by the Société. So here the no-fault scheme does not displace the normal tort liability completely. The Société is subrogated to the resident's claims to the extent compensated by the Société. This is not applicable in case of an accident between two residents of Quebec occurring outside Quebec. The Société does not compensate a non-resident for an accident outside Quebec but caused by a resident of Quebec. The owner of a vehicle registered in Quebec is obliged to take insurance cover for material losses. This insurance also covers liability for bodily injury caused elsewhere in Canada or the USA.

We will here not deal with the exact types of harms that are covered by the scheme, what the exact procedure is before the Société, or the modalities of payment of the compensation.

[35]GA Trudel, *La politique d' indemnisation de dommage corporel de la regie de l' assurance automobile de Quebec et ses programmes de readaptation sociale* (Les Editions Yvon Blais, 1986) 46–47.
[36]Art. 9 Loi sur l'Assurance Automobile.
[37]Art. 83.61 Loi sur l'Assurance Automobile.

4. Implementation for self-driving cars: the modalities of NFCS

The Quebec NFCS is but one example of such a scheme. In other jurisdictions, NFCS have been implemented in different ways. For example, not all jurisdictions exclude recourse to tort. In many other jurisdictions with NFCS, costs not compensated under the NFCS can be claimed in tort procedures, sometimes only if they meet a certain threshold.[38] These schemes are sometimes called add-on or threshold schemes.[39] Another variation in the set-up of NFCS concerns the insurer. In Quebec, the law lays the insurance exclusively in the hands of one state-insurer.[40] In many other jurisdictions, it is private insurers who execute the NFCS.[41] Jurisdictions with NFCS are currently ones that apply NFCS to human-driven vehicles. The self-driving aspect may influence how certain policy choices for NFCS are made. Given the role of manufacturers, one may question whether it still needs to be the possessor of a vehicle who takes out insurance. Could it also be the manufacturer? If the manufacturer takes out insurance does the manufacturer need to place the insurance in the hands of an insurance company or is it also possible to self-insure?

These remarks give us a number of questions and options:

- Who takes out the insurance? The owner or the manufacturer?
- Is the insurance task[42] taken care of by the state or by private insurers or, through self-insurance?
- Is a pure, add-on or threshold scheme chosen? In other words, does it rule out tort law completely or does it still play a role, subject to certain conditions?

The possibility of self-insurance by a manufacturer makes it difficult to discuss the first two bullet points separately. So the issues of who takes out insurance and who is the insurer, will be discussed integrally below. The issue of pure, add-on or threshold systems will be discussed thereafter.

5. Evaluation of the choices from the perspective of the three framework dimensions

5.1. Who is the insurance taker and who the insurer?

NFCS rely heavily on insurance. A statute governing the NFCS mandates typically who is obliged to take out insurance and who can act as insurer. The following two subsections elaborate on this.

[38]For the various regimes in the provinces and territories of Canada, see Craig Brown, *No-Fault Automobile Insurance In Canada* (Carswell 1988), Chapter 6.
[39]See Joost (n 2).
[40]Also in New Zealand (Joost (n 2), Section 7.4, p. 8).
[41]See for example Israel (Joost (n 2), Section 7.3, p. 6), Sweden (Joost (n 2), Section 7.6, p. 22).
[42]I mean here spreading the risk, not so much administration of claims.

5.1.1. Who takes out insurance?

In many jurisdictions that have a NFCS for road accidents, it is the possessor of the vehicle who is obliged to take out the insurance. There are a number of reasons for imposing the duty to insure on this actor. First, accidents happen and insurance is needed, if and when a vehicle is being exploited or used. It is the possessor who benefits from exploitation or use. Second, the possessor has first-hand knowledge about the timing of exploitation and use. It is practical to oblige him to take out insurance. Third the possessor is easy to identify and this makes enforcement of the duty to insure easier. Finally, as long as automated vehicles require a human driver or supervisor, an insurance such as that taken out for completely human driven vehicles is needed.

However, as indicated above, for self-driving vehicles it may make sense to oblige the manufacturer to take out insurance. Accidents happen because the driving technology does not function adequately. By taking out insurance, the manufacturer assumes responsibility for his product. A few manufacturers, including Volvo, have publicly indicated that they want to take responsibility for accidents with their self-driving vehicles.[43] They have not indicated that they see this in the context of NFCS. Nevertheless, since we are here looking at NFCS, we consider how this intention could be translated in the context of a NFCS. Since this is new ground, it is worthwhile to elaborate on this.

First, it may need to be clarified that we are not talking about the insurance that shields a manufacturer from the consequences of being held liable, for example, on the basis of product liability.[44] Under a NFCS, a manufacturer takes out insurance on the vehicle. In the case of an accident, the insurer pays to the victim (the insured), who need not prove that grounds for liability are present. This is a form of direct insurance. That is to say, this is like first-party insurance in that it does not insure against the loss that flows from being held liable. It is insurance against the harm that ensues from an uncertain factual event, such as an accident. The difference with a first party insurance is that it is not the insured party who takes out the insurance policy himself.[45] It is however also not your typical third-party insurance, since it is not the tort-feasor, but the victim who is the insured party. To obtain compensation, the victim only needs to show that he suffered harm that falls within the terms of the policy. The victim need not show that any party is responsible for the harm.

[43]Volvo Cars, *Volvo Cars Responsible for the Actions of Its Self-driving Cars*, 20 October 2015, https://www.volvocars.com/intl/about/our-innovation-brands/intellisafe/autonomous-driving/news/2015/volvo-cars-responsible-for-the-actions-of-its-self-driving-cars, accessed 15 March 2018. Nico de Mattia, *BMW to take full responsibility for its autonomous cars*, 9 December 2016, http://www.bmwblog.com/2016/12/09/bmw-take-full-responsibility-autonomous-cars/, accessed 15 March 2018.

[44]Such insurance may for example cover the cost of a product recall. See, Viktor Foerster, Tibor Foerster and Tim Pahl, *Handbook of product Liability/Recall/Insurance in Germany* (Publishing House tredition, 2012) 80.

[45]Faure and Hartlief (n 3) 257–58.

Second, insurance by the manufacturer may pose practical difficulties around the timing and need for insurance. Vehicles need to be insured when they are in use. The possessor knows when his vehicle is in use and can easily make sure that the vehicle is insured when it needs to be insured. The manufacturer does usually not know when a vehicle is in use. Not all cars last for the same amount of time. Some cars are involved in an accident shortly after they have entered circulation and are scrapped and other cars may be around for 30 years. The usage of the vehicle is relevant for its insurance and possibly for the payment of insurance premiums. If self-driving cars are owned by their users, as is now often the case with human-driven vehicles, an arrangement needs to be found, allowing the manufacturer to know for which vehicles insurance is needed. This can be achieved in various ways. The manufacturer may pay a lump sum at once. Another option is a contributory system. The possessor of a vehicle could self-report for insurance. Alternatively, a technical solution could be employed since cars will become increasingly interconnected and a manufacturer may see in received technical data whether the vehicle is still in use and a drive-as-you-go insurance may be developed. A technical solution would need to comply with the applicable privacy and data protection rules. However, all these options presuppose that vehicles are owned by their users. Maybe this will no longer be the case with self-driving vehicles. The distribution of cars is now already to a large extent a lease market. If this trend continues, car manufacturers may at some point stop selling cars and only 'lease' or rent them. The manufacturer then has direct information about which cars are still in circulation and need to be insured. An additional benefit is that manufacturers have more control over the end of life of a vehicle. Vehicles with obsolete (safety, self-driving, environmental) technology can more easily be phased out. This is not the place to recommend one solution for taking out insurance over another. The purpose is just to show that there are various options to solve what might look like a difficult practical problem.

5.1.2. The insurer

There are various actors who are candidates for the role of insurer. In many jurisdictions' NFCS, the task is left with private insurers. Two other variants – insurance by the state and self-insurance by the manufacturer are discussed below.

5.1.2.1. Insurance by the state. This is the model chosen in Quebec. This choice foregoes competition between insurers. It therefore requires a justification. One possible justification is that a monopolistic insurer can spread the risks and overhead costs over a larger group of insureds and may therefore be able to charge a lower premium or be more generous with compensation. The law of large numbers states that the expected expenditure on

compensation will more closely match the sum of actual compensation to be paid if the number of insureds is larger. The greater number lowers the risk for the insurer and therefore allows for lower premiums.

5.1.2.2. Self-insurance by the manufacturer. For self-driving vehicles a third option needs to be discussed: a manufacturer may act as the insurer or the task may be left to an insurer who is closely linked to a manufacturer. In the former case, the manufacturer is obliged, just like an insurer would be, to pay out in case of harm caused by the vehicle without the need for the victim to establish responsibility of anyone for the accident. Rules that are usually applicable to insurers about good financial management would be applicable to self-insurers as well. The manufacturer should, for example, set funds apart to pay compensation in such a way that its ability to pay would not be affected in case of bankruptcy or other mishap to the other commercial operations of the manufacturer. Legislation will most likely not designate a manufacturer as the only option for insurance: what would be the rationale for such designation? However, legislation may leave this possibility open when insurance is left to private parties.

5.1.3. Reduction

This simplified model of reality gives us theoretically six ways to organise a NFCS: two options for choosing the insurance taker (possessor and manufacturer) and three options for choosing the insurer (private insurer, manufacturer or state). However we need not discus all six exhaustively, since some options are less likely or can be taken together for the purpose of this article.

Where the manufacturer takes out insurance the discussion can be simplified. This can be seen as follows. The number of manufacturers is relatively small. A private insurer would have only a small number of manufacturers as its client. Even a monopolistic state insurer who would have all manufacturers as insurance takers would still have a limited number of clients. At the same time, each manufacturer would take out insurance on a large number of vehicles. It is therefore likely that every year, some vehicles of each manufacturer will be involved in accidents, requiring compensation payments. Assuming that compensation has to be funded from premium income, this would mean that the premium a manufacturer pays would have the same order of magnitude as the compensation paid per manufacturer. If the premiums are not, or are insufficiently, differentiated, then adverse selection would make manufacturers who are the best risks leave – a known death-knell for insurances – or force the insurer to engage in premium differentiation. However, perfect premium differentiation would make the premiums exactly match compensation paid for accidents with vehicles from the pertinent manufacturer, making insurance pointless. In other words, from the perspective of a manufacturer, taking out insurance does not make much sense. The manufacturer may as well engage

in self-insurance. Therefore, if the manufacturer is insurance taker, then the options will converge to self-insurance. Even if a manufacturer would choose to take out insurance with a private insurer, the insurer – or at least its auto-insurance business – would be economically dependent on the manufacturer, since the manufacturer would be the only, or one of a few, manufacturers taking out vehicle insurance and moreover, a client that brings in many vehicles at once. So, in such a situation the insurer would hardly be able to act independently from the manufacturer. Therefore, only the case of self-insurance will be discussed in this article. The case of a manufacturer taking out insurance with a private or state insurer will only be occasionally mentioned.

Where the possessor is obliged to take out insurance, I see no plausible reason to oblige him to take out insurance with the manufacturer. A manufacturer may offer insurance to (prospective) possessors, but it would be up to the possessor (assuming that the possessor has such a choice) to decide whether he insures with the manufacturer or with another private insurer.

Further discussion can and will be limited to three options. These are: self-insurance by the manufacturer, and insurance taken out by the possessor. In the latter case, a distinction can be made between insurance by private insurers or by a monopolistic state insurer.

5.2. Comparing the compensatory options relative to victim protection, prevention and innovation

5.2.1. How does the choice of insurer or insurance taker affect victim protection?

If insurance is laid in the hands of private insurers and it is a vehicle possessor that takes out insurance, then the possessor may be able to benefit from competition between the insurers. This can be competition with regard to the amount of the premium, the extent of the cover (for as far as this extends beyond the statutory minimum cover) and the claim administration. Such competition may discipline the behaviour of the insurers for the benefit of the insureds and the insurance taker.

If the manufacturer engages in self-insurance, a concentration of functions occurs. The manufacturer not only provides the possibly defective vehicle, but also the insurance. This does not mean that there is no competition in the insurance. A client may take the features of the insurance into account when choosing which vehicle to acquire, lease or rent. Since the insurance comes here as one element in a bigger package, it can be expected that competition with regard to the insurance aspect will be less effective.

Theoretically, insurance by the possessor seems the better option because it provides better framework conditions for competition. Whether this is practically also true, is less clear. Manufacturers may also offload the costs of accidents on their suppliers and choose to spare their customers.

With a monopolistic state insurer the element of competition is of course not present. This gives theoretically a risk that the insurer can behave more independently from its clients. Experience with state insurance in Quebec does however show that a state system can function well. To some extent, the lack of competition is compensated for in legislation. Legislation can require a minimum insurance cover and set tariffs for the compensation payable per type of loss. For example, the Loi sur l'assurance automobile in Quebec provides elaborate rules about cover and tariffs. Furthermore, a monopolistic insurer can spread the risks over a larger number of insurance takers, potentially resulting in lower premiums or more generous compensations.

Although there are advantages and drawbacks associated with the various options, victims easily obtain compensation, without showing responsibility and even in the absence of a liable party (one-sided accidents). So there is reason to contemplate one form or another over a liability-based system.

5.2.2. Prevention

Manufacturers are the parties that are best able to make their vehicles such that they do not cause accidents. To what extent does the NFCS incentivise a manufacturer to take preventive measures?

Where the possessor takes out insurance, the insurer pays compensation to victims. This does not affect the manufacturer. Only if and when the insurer seeks and succeeds in getting redress against the manufacturer will the manufacturer internalise the costs of accidents with its vehicles. This requires that insurers are subrogated to their clients' product liability claims against manufacturers or that they have their own statutory right to hold manufacturers liable. This approach therefore requires active insurers and will involve claims based on product liability. If the fact that there are relatively few product liability cases in the EU[46] is an indication that product liability cases are perceived as difficult or risky, then this makes the possessor-takes-out-insurance option less attractive from a prevention perspective. Moreover, if insurers do not claim from manufacturers, the chances are that the costs of accidents are spread over owners of all makes of automated vehicles. This would shield the makers of less safe vehicles and therewith be counterproductive from a prevention perspective.

Where the manufacturer self-insures, he internalises the costs of accidents since he has to pay for the costs of accidents. However, if the manufacturer takes out insurance with an external insurer, the possibilities for the insurer to spread the risk over multiple clients (manufacturers) are limited, because the number of vehicle manufacturers is relatively small. So, this too leads to substantial internalisation of costs: the premium paid is the same order of magnitude as the compensation paid to victims of vehicles of the pertinent make.

[46]See Machnikowski (n 6).

The advantage of this option is that the internalisation is automatic. Once the victim has been compensated the internalisation is a fact. It channels internalisation predominantly to the manufacturer that produces vehicles that are less safe. If the compensation paid out by a manufacturer producing unsafe vehicles (casu quo his insurance premium) is substantial, this may force the manufacturer to increase the price of its vehicles, thereby making them less attractive to acquire.

In short, a NFCS where a manufacturer insures gives an economic incentive to take preventive measures without relying on redress. This is a strong argument for such regime, over a NFCS where the possessor insures and over current liability-based schemes.

5.2.3. Innovation

The willingness of manufacturers to innovate may suffer if they have to internalise the costs of accidents. Which policy option would minimise chilling effects? A general observation is that the effects of the NFCS are relatively calculable.[47] It is not necessary to provide proof of a party's responsibility for the accident. Hence, any uncertainty about the outcome of the responsibility question is eradicated. Also the amounts payable are reasonably calculable. The types of losses for which compensation can be obtained and the amounts payable are precisely circumscribed in legislation. This does not necessarily mean that the total annual sum paid to victims is lower than would have been the case under a tort-based liability scheme, but the issue of compensation is more manageable because there are fewer uncertainties.

Are there differences between a scheme in which the manufacturer self-insures and one where the possessor takes out insurance? Under a scheme with self-insurance, a manufacturer will have to stand all compensation paid. Under a possessor-insures-scheme the manufacturer only carries the cost if and when insurers seek and obtain redress. Moreover, insurers can only seek redress for amounts paid to victims. So any limitation there (fixed amounts instead of actual losses) also limits the amounts that can be claimed in redress. So purely from the perspective of amounts payable, a possessor insures-scheme is probably more beneficial for the manufacturer. A drawback of the latter scheme is that it occasionally may lead to court cases by redress-seeking insurers which may give unwanted exposure of the manufacturer to publicity. However, a manufacturer may try to prevent exposure in court via amicable settlements with insurers.

A scheme in which the manufacturer insures is possibly not optimal in preventing chilling effects. The question is whether it will have appreciable

[47]We are here not looking at the influence of tort in add-on or threshold schemes. That is something done in the next section. Hence, the main characteristic of NFCS discussed in this section is the fixed nature of the amounts payable.

negative effects. Many manufacturers are investing heavily in the development of self-driving vehicles and competition is driving the development forward. It is questionable whether a compensation scheme can reverse this, as long as manufacturers remain convinced that they can build safe automated vehicles.

5.3. Pure, add-on or threshold schemes?

As we saw above, Quebec has a pure NFCS. For corporal damages, a victim can only claim under the scheme. Any action in tort is excluded. Many other jurisdictions, have so-called add-on or threshold systems.[48] These systems do not exclude actions in tort. Both in add-on and threshold systems, damages that have been compensated under the NFCS cannot be claimed again in tort. For losses that were not compensated by the NFCS, the victim can seek compensation in the 'normal' tort system. In an add-on system, usually no further conditions are specified for access to the tort system. In threshold systems, additional conditions need to be met. For example, the victim's medical expenses should exceed a certain amount or the victim has sustained a certain type of bodily injury of a certain seriousness.[49] Many NFCS systems were introduced to relieve courts from simple road accident damages cases that by their sheer number were overloading the resources of court systems. An add-on or threshold system may function well enough to achieve the goal of reducing the number of simple road accident cases. At the same time, a NFCS can be kept simpler, cheaper and less-encompassing if the tort system is available in the background for dealing with the more demanding cases. Hereinafter, I will no longer distinguish between add-on and threshold systems – unless indicated differently – and will discuss the relative merits of these schemes compared to pure NFCS.

The question is: how do these various schemes compare when it comes to victim protection, prevention and innovation?

5.3.1. Victim protection

Under a NFCS, victims generally do not get their full harm compensated, but instead fixed sums. This means that a pure system needs to be more generous in the sums it compensates than an add-on or threshold system. The pure system in Quebec is said to be indeed rather generous.[50] Under add-on or threshold systems victims can get their full loss compensated. They do need to hold the responsible party liable. The NFCS may make it easier to deal with tort liability, since a victim's first costs are covered by the NFCS. It

[48]Very few states have a fourth variant: choice systems. Here, a motorist can choose to which scheme he contributes: tort or NFCS. Since choice schemes expose motorists to great risks these schemes are not further discussed here: motorists choosing NFCS are exposed to liability if they are found responsible for an accident. Motorists choosing for tort and becoming the victim of an accident, may find themselves confronted with an insolvent responsible party (if the latter chooses NFCS).

[49]Joost (n 2), Sections 6.6–6.8.

[50]Joost (n 2), Section 7.5, p. 12.

unburdens victims, freeing up resources to take on a liability case.[51] A policy issue is how the victim is perceived. Should the victim be seen as a party whose interests need to be cared for (in a pure scheme) or can some responsibility to find full compensation be laid on the shoulders of the victim (in an add-on or threshold scheme)? Given that road accident liability or compensation schemes over the last decades have lowered victims' threshold to compensation a scheme that does not require the victim to litigate is probably more in line with modern developments. Moreover, victims may have to litigate about product liability, which given its complexity may not be very attractive. If at all, it stands to reason to consider here a threshold scheme for special circumstances rather than an add-on scheme.

5.3.2. Prevention

NFCS applied to human driven vehicles sometimes face the criticism that they constitute a moral risk. Knowing that they are well insured under the NFCS, human drivers are tempted to drive more dangerously. Some research from Quebec corroborates this,[52] while later research challenges that finding.[53] Whatever the truth, in the context of self-driving vehicles, NFCS appear to have a much bigger capacity to make those that can prevent accidents internalise the costs. As we have seen above, I see the manufacturer as the party best able to take measures that prevent future accidents. If a NFCS causes the manufacturer to internalise some or all costs of accidents, this provides an economic incentive to take preventive measures. A NFCS can cause a manufacturer to internalise costs in various ways: through self-insurance, through redress-seeking insurers or via claiming victims (in add-on or threshold schemes).

Let us assume that the level of prevention increases with the extent to which a manufacturer can be made to internalise the costs. It is difficult to gauge whether a pure or an add-on/threshold system leads to higher internalisation. The total sum of compensation paid to victims constitutes the potential for internalisation. A pure NFCS may limit the potential internalisation because fixed sums instead of the true losses are awarded to the victims. On the other hand, pure NFCS offer less opportunity to withhold compensation: the claimant need not show that somebody is responsible for the accident. An add-on or threshold system builds partially on the tort system. Under a tort system, a victim can usually claim the totality of losses sustained. This may point to high internalisations. However, the distribution of compensation across victims is much more uneven, since victims have a heavier load to carry: they need to show responsibility of the defendant. So as far as the amount of

[51] Sugarman (n 1) 307. For compensation schemes outside the realm of road accidents, this may be different. See: Pearl (n 4), Section II B.

[52] Sugarman (n 1) 324. For the USA, see also Alma Cohen and Rajeev Dehejia, 'The Effects of Automobile Insurance and Accident Liability Laws on Traffic Fatalities', NBER Working Paper No. 9602, April 2003.

[53] Sugarman (n 1) at 326.

internalisation is concerned it is not clear which scheme leads to the highest internalisation-burden. Perhaps the difference in internalisation will not be very large, since add-on or threshold schemes have a NFCS component too. For the total amount of internalisation, it may therefore not make much of a difference, but the uncertainty and exposure to court cases in an add-on or threshold scheme makes for a stronger incentive. Moreover, in court cases, the actual victims, not insurers, are the claimants. From a publicity perspective, this makes it even less attractive for manufacturers.

Even though an add-on or threshold scheme may have advantages from a prevention perspective, it adds complexity. The question is whether the added complexity is worth the benefits it may carry. If at all, a threshold scheme may be considered rather than an outright add-on scheme. It could act as a safety net for unforeseeable cases, given the little experience that exists with driving automation.

5.3.3. Innovation

Innovation and prevention can be seen as the opposite sides of the same coin. The more costly the preventive measures that a manufacturer must take, the less attractive it is to be active in the field and the longer innovations take to reach the market. So while add-on schemes might be expected to lead to more prevention they are also more likely to slow down innovation. This reinforces the argument that the added complexity of an add-on or threshold scheme is only worth the bother if clear benefits are to be expected.

6. Conclusion

With self-driving vehicles, accidents are still likely to occur and victims are likely still to be dependent on compensation. The current liability-based schemes build to a large extent on liability of the human driver or possessor of the vehicle, whose insurance will compensate victims. With self-driving vehicles taking over ever more driving responsibilities, this scheme that lays liability with the driver or possessor exhibits some limitations. On the one hand, an economic incentive for prevention by the manufacturer becomes more relevant while it is unclear whether redress is able to meet that need. On the other hand, a liability scheme limits progress in easing a victim's access to compensation. These are limitations that a NFCS can overcome.

However, there is no such thing as 'the' NFCS. NFCS have many features that can be chosen in one way or another. These features can be seen as policy levers that can be wielded to achieve different policy goals. If society considers NFCS a viable route, it should think about the policy goals that it wants to achieve with NFCS.

This article, having examined a number of policy levers and identified a number of relevant policy-issues, has taken a view on some of these policy issues and left others open.

It has been argued in this article that a liability or compensation scheme should provide an economic stimulus to manufacturers to take measures to prevent accidents. This immediately is a contested issue. A stronger emphasis on prevention may delay market introduction of new self-driving features and in this sense slow down innovation. It also touches upon the question whether government authorities have enough of a grip on the matter to ensure the safety of automated vehicles.

If prevention is a policy goal, there are several ways to stimulate it. In this article, it has been suggested that automatic internalisation of accident costs by self-insuring manufacturers is to be preferred over redress-based schemes. Once legislated, self-insurance is a largely maintenance-free system. However, it marginalises the role of insurers and any beneficial effects their intervention may have.

Another question is whether tort should be given a place in the scheme and, if so, what role. This article is more neutral about the role of tort. Tort can act as a safety net, which is especially relevant if the self-driving future is seen as uncertain. This may warrant a limited role. However, it does add complexity to a scheme, while the trend seems to be to remove thresholds for victims to obtain compensation.

Turning more to the victim protection side of the debate, it is important to decide on the role that victims play: are they mainly seen as passive receivers of compensation who need to be cared for or could society accept a simpler NFCS awarding victims an easily obtainable but limited compensation and leaving it to them to seek full compensation in tort? In other words, does society opt for more paternalism or for more own responsibility (and possibly higher compensation)?

In sum, NFCS have sufficient potential to help solve many of the questions that accidents with self-driving cars raise. But working out a concrete scheme requires many policy decisions to be visited and researched. This article cannot and does not intend to answer all the many questions that it raises. Its intention is more modest, sketching what a NFCS for automated vehicles may look like and what questions and issues it raises, in order to have a more informed discussion about the choice between liability and NFCS options.

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