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## Innovative insurance schemes: pay as/how you drive

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### Abstract

The objective of this paper is to provide a critical review of the most popular and often implemented methodologies related to Usage-based motor insurance (UBI). UBI schemes, like Pay-as-you-drive (PAUD) and Pay-how-you-drive (PHUD), are a new innovative concept that has recently started to be commercialized around the world. The main idea is that instead of a fixed price, drivers have to pay a premium based on their driving behaviour and degree of exposure. Despite the fact that it has been implemented only for a few years, it is proven to be a very promising practice with a significant potential impact on traffic safety. This is achieved by the financial incentive given to drivers in order to improve their driving behaviour such as reducing the number of harsh braking and acceleration events taking place or reducing their degree of exposure such as their annual mileage, the time of the day travelling etc. and therefore reduces traffic risk. It can also be beneficial towards other social objectives such as traffic congestion and pollution emissions reduction.

To this end, the existing literature on UBI schemes is critically reviewed and research gaps are identified. Findings show that there is a multiplicity and diversity of several research studies accumulated in modern literature examining the correlation between PAUD (based on driver's exposure) and PHUD (based on driving behaviour) schemes and traffic risk in order to determine accident risk. Moreover, it seems that UBI implementation would eliminate the cross-subsidies phenomenon, which implies less insurance costs for goods and less exposed drivers. Moreover, it would also provide a strong motivation for drivers to improve their driving behaviour and reduce their degree of exposure by receiving feedback and monitoring their driving performance and exposure which would result in traffic risk reduction both totally and individually.

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## 1. Introduction

Current pricing policy of motor insurance companies around the world which is to charge a lump sum for each user is unfair and inefficient (Butler et al. 1988). Drivers with similar characteristics such as age, gender, location, accident record etc. pay approximately the same premiums no matter if they drive five or fifty thousand kilometres a year. Bordoff and Noel (2008) likened it to a restaurant with an unlimited food policy for a fixed charge per person which encourages people eating more. Respectively, current insurance pricing policy encourages driving more kilometres annually, does not punish aggressive driving behaviour and on the other hand, it does not encourage prudent driving behaviour. But above all, this implies increased number of accidents, congestion conditions, carbon emissions, local pollution and oil dependence. Current pricing system is unfair because it literally forces drivers with low mileage per year and safer driving behaviour to subsidize the insurance costs for drivers who drive more annually and more dangerously. It has to be noted that research so far indicates that people with lower income drive fewer kilometres.

In general, each driver could be assigned a probability of accident involvement based on his driving behaviour. Charging all drivers a lump sum, conceptually leads to assume that the accident probability is equal across the entire population of drivers. Evidently, this does not from a user optimum and socially equitable approach, as drivers with lower accident risk are forced to “subsidize” those with higher. In other words, safer drivers are forced to “buy” higher probability of accident risk than actually exists, unlike dangerous drivers who “buy” less.

An innovative insurance policy could have a significant effect on safety depending on its design (Zanema et al. 2008). This can be accomplished by differentiating premiums to reflect safety, more specifically charging higher fees for unsafe road categories and night-time driving, most effectively and apply it to all drivers. The insurance policy based on vehicle use (Usage Based Insurance or otherwise UBI) includes Pay-As-You-Drive Systems (PAUD) and Pay-How-You-Drive (PHUD). PAUD system is charging premiums based on total exposure characteristics such as mileage and road network used while PHUD is based on individual driving behaviour measuring parameters such as speed, harsh acceleration, hard braking etc. The main data source for the aforementioned parameters are the automotive diagnostic systems, OBD (On-Board Diagnostics), installed in the vehicle and/or the Smartphone held by drivers, sending all necessary information in a central database via mobile network.

The main advantages of UBI schemes compared to the conventional solution offered so far are (Sugarman 1994, Litman 2004):

- Each user will pay as and how he drives, not based on other unfair characteristics such as age, type of car, etc., which do not necessarily reflect the chance of being involved in an accident.
- The need for cross-subsidies (cross-subsidies phenomenon) will be lower and result in a lower and more affordable cost of insurance premiums which would lead to a smaller number of uninsured vehicles.
- This method itself is an incentive for users to improve their driving performance and consequently reduce the number of accident in which someone causes or gets involved in. It also enables someone to monitor his behaviour while driving thus eliminating behaviours that increase the likelihood of causing an accident.
- The implementation of this approach will help reduce the total number of accidents leading ultimately to significantly upgraded road safety.
- With regards to the social benefits, this method will assist driving behaviour improvement and thus reduce pollutants emission, saturation, energy consumption and will generally upgrade transportation system.

An additional benefit offered by UBI schemes is user's feedback on driving behaviour by receiving statistical reports, after or while driving, such as the percentage of speeding, number of harsh acceleration/braking events, time driving during risky hours, fuel consumption etc. (Toledo et al. 2008). In this way, UBI may also serve as a mechanism to raise drivers' awareness and change (improve) their driving behaviour. First, because the economic incentive will be strong for him. The premiums will be very high especially for dangerous drivers so the motivation to drive safer will be very powerful. The same would apply to safe drivers as well since premiums cost will be reduced because of their good performance. Second, the ability to monitor and compare their own performance from now onwards will assist towards their performance improvement. It is generally shown that (Birrell et al. 2014) an in-vehicle smart driving system, e.g. a smartphone application pointing out frequent mistakes a driver makes while driving, which is developed and designed based on drivers' requirements information can lead to significant improvements in driving behaviours.

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