CHAPTER 7

Providing State-Supported Financial Incentives and Benefits for Vehicle Insurance Policies Using Telematics

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Abstract We recommend providing state-supported financial incentives and benefits for vehicle insurance policies using telematics. To achieve this policy recommendation, we propose the following: (1) Provision for financial incentives and benefits by the state for vehicle insurance policies using telematics across the European Union member states; (2) Conduct comprehensive social cost–benefit analysis (CBA) to assess policy

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feasibility, either at a European Union or at a national level; (3) Advocate for European Union-level policy implementation supported by a centralized fund to promote telematics via insurance policies, aligning with the EU Green Deal and Vision Zero targets; and (4) Showcase benefits of interdisciplinary collaboration involving experts from transportation engineering, economics, psychology, and law for policy design and evaluation.

Keywords Telematics · Vehicle insurance · Social cost–benefit analysis

Introduction

Climate change, environmental degradation, energy use, and road safety are key existential threats to Europe and worldwide that should be addressed. Transport is responsible for about a quarter of the EU's total CO_2 emissions, 71.7% of which come from road transport (European Parliament, 2023). As an additional detrimental transport externality, road safety emerges as a major public health issue that requires immediate coordinated efforts and effective prevention, as crashes are the leading cause of death until 29 years globally. Although several efforts are being made to improve road safety, at a global level the death toll remains very high, estimated at 1.19 million fatalities annually (WHO, 2023) and at 20,640 fatalities in the EU in 2022 (EC, 2023). Therefore, the need for a solution that can mitigate these challenges is evident .

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Undeniably, the public investments on infrastructure and the interventions in the legislation that have been carried out in Europe in the last years, have significantly contributed to the improvement of road safety; yet further contribution will be limited, and it requires high investment and significant time. Additionally, considering (i) the average vehicle age in EU (~12 years) and the old fleet in several EU countries, especially in southeast Europe with an average age greater than 15 years (ACEA, 2023), (ii) the slow renewal rate, and (iii) the relatively small role of the vehicle in crashes (Singh, 2018); the future contribution of the vehicle improvement in road safety and climate change is expected to be low. On the other hand, *driving behaviour* is the most critical factor and the root of the problem in road safety (Singh, 2018), energy efficiency, and the environment (Singh & Kathuria, 2021). Therefore, state initiatives and policies should focus on the improvement of driving behaviour, to achieve the target of decreasing road fatalities by 50% until 2030, with the most effective tool for driving behaviour assessment and improvement being telematics technology.

Telematics utilizes Artificial Intelligence and data from smartphones, devices installed in the vehicle (e.g., OBD: On-Board Diagnostics, cameras) and connected vehicles to monitor, evaluate and improve driving behaviour, promoting safe and eco-driving, reducing road crashes by 20%-50% (Reimers & Shiller, 2019; Ziakopoulos et al., 2022) and fuel consumption and CO_2 emissions by up to 30% (Barkenbus, 2010; Wu et al., 2011; Tulusan et al., 2012; Toledo & Shiftan, 2016; Michelaraki et al., 2020).

Meanwhile, insurance companies have already *integrated telematics into their insurance products*, offering Usage-Based Insurance schemes such as Pay-How-You-Drive, offering financial rewards to drivers based on their safe driving behaviour. The widespread adoption of telematics through insurance products holds the potential for significant benefits to society by reducing road crashes and the environmental impact, to consumers, and insurance companies. For consumers, telematics-based insurance offers significant advantages over traditional insurance, including education features to improve their driving behaviour, financial benefits, and rewards (e.g., discounted insurance premiums, gamification rewards, loyalty schemes). Insurance companies benefit from the ability to accurately quantify driving risk, reduce their claims costs by providing financial incentives to safe drivers and improving driving behaviour, increase their customer portfolio by providing discounted insurance premiums, create

new revenue streams, increase the customer retention, and consequently decrease their Loss Ratio.

However, the vehicle insurance sector has very low capabilities of further investments and risk (Combined Ratio ~ 100%), due to low insurance premiums and relatively high crash frequency (EMIM, 2019). Therefore, state support is required for the wide acceptance and use of telematics that will lead to significant societal and environmental benefits.

In this framework, *the provision of financial incentives and benefits by the State for vehicle insurance policies using telematics* is proposed across the EU member states. The policy recommendation consists of the following:

- *Financial incentives in the form of a "Safe Pass" Voucher*: Provision of a "Safe Pass" Voucher for drivers upon the purchase of a telematics insurance policy. Alternatively, the financial incentive could be provided in the form of the complete abolition of premium tax on vehicle insurance policies using telematics in combination with a Voucher.
- *Additional Benefits for Safe Drivers*: Provision of additional benefits to safe drivers that have a score higher than a high threshold. Safe drivers who renew their insurance policy using telematics will enjoy additional benefits, including: (a) free access in city centres, (b) free parking (in areas that there is a parking cost), and (c) use of bus lanes.

This policy recommendation calls upon national governments and EU policymakers to implement initiatives such as the "Safe Pass" Voucher, incentivizing the adoption of safer and eco-friendlier driving behaviours. Insurance industry stakeholders are poised to play a key role by integrating telematics into their products, leveraging the recommended financial incentives to enhance policy attractiveness. Simultaneously, telematics industry stakeholders will be essential in providing the technological backbone, ensuring that such policies are grounded in reliable data and advanced analytics to foster safer and more environmentally friendly driving practices across Europe.

To emphasise the socio-economic feasibility of this policy, a comprehensive *social CBA case study in Greece* is conducted. Implementing such a policy requires concerted collaborative efforts across various

fields, including transportation engineering, computer science, finance, behavioural psychology, digital law, and legislation related with the protection of personal data. These efforts will ensure the comprehensive design of the policy, its successful implementation, and socio-economic feasibility.

Transportation engineers and financial experts play a pivotal role in the development of the socio-economic analysis framework with advanced tools for data handling, modelling, and simulation, quantifying and projecting the long-term impact of telematics on road safety, travel time, fuel consumption, and emissions, translating these effects into monetary terms, and incorporating the appropriate economic indicators (e.g., Net Present Value (NPV)) to ensure the social feasibility of the policy. Their collaboration is integral in investigating suitable forms of financial incentives.

Behavioural psychology experts along with transportation engineers contribute significantly to comprehending (a) how individuals perceive and respond to policy changes by aiding in the development of stated preference surveys that investigate public acceptability of the proposed policy and (b) how the feedback, financial incentives, and benefits contribute to the driving behaviour improvement.

Legal experts guide the endeavour through the regulatory landscape, addressing the legal aspects of telematics technology and ensuring compliance with existing legislation and regulations related to insurance, data privacy, and consumer protection. With regard to the management of the personal data of drivers who will be insured using telematics, EU through the European Data Protection Board has already issued Guidelines regarding the management of data from Connected Vehicles, "Guidelines 1/2020 on processing personal data in the context of connected vehicles and mobility-related applications" (Adopted: March 2021) which contain specific references and examples for telematics insurance products. Therefore, the treatment of personal data in insurance policies using telematics is sufficiently regulated and it does not include any risks.

The Case Study

To demonstrate the socio-economic feasibility of the policy recommendation, a social CBA is conducted in Greece, as a case study, with a time horizon up to the year 2030, focusing on passenger cars (Petraki et al.,

2024). The analysis aims to showcase the tangible socio-economic benefits, resulting from reduced road casualties, fuel consumption, and CO_2 emissions. The methodology is based on European guidelines for CBA (EIB, 2013; Sartori et al., 2014).

Four alternative Scenarios are investigated, with different provided financial incentives and benefits by the Greek State to the insurance policies using telematics. These Scenarios S1, S2, S3, and S4 involve Safe Passes with values of €50, €55, €60, €70, considering the average car insurance premium in Greece (Insurancemarket, 2022). Scenario Zero (S0) represents the baseline "do-nothing" situation in which the provision of Safe Pass is not considered and against which, Scenarios S1-S4 are compared. The aforesaid values of Safe Passes are considered indicative for Greece to achieve high demand of insurance telematics, and they should be adjusted in any other country, considering the average vehicle insurance premium.

A *questionnaire survey* was conducted (Petraki et al., 2024), using the stated preference methodology, to determine the level of public acceptance of each Scenario. Behavioural psychology expertise contributed in the survey by ensuring the questionnaire format was unbiased and concise, and adhered to ethical standards. From the 1,250 respondents, the answers of 897 passenger car drivers were considered. Based on the answers a linear regression model is developed to predict the sensitivity of the public acceptability of telematics against the financial incentives showing that the percentage of drivers who would buy a telematics insurance policy depends significantly on the financial benefits provided (p-value ≤ 0), highlighting the need for the state to provide financial incentives and benefits to telematics insurance policies.

Therefore, considering the number of insured vehicles in Greece (HAIC, 2023) and the policy acceptance, the annual number of Safe Passes for each Scenario in Table 7.1 is expected that will be fully consumed. Anticipating a period for updating and maturing the market and the implementation period, the number of Safe Passes offered in the first year (2024), is lower by 50–60% compared to the subsequent years.

For each Scenario, the estimated State Grant for the provision of the Safe Pass, and *the effects* on road casualties, fuel consumption, travel time, and CO_2 emissions from passenger vehicles by 2030, are calculated and expressed in monetary units. Specifically:

Road Safety

- Injury crash statistics in Greece of 2019 (prior to COVID-19 pandemic) are considered as representative, including road fatalities, severe and light injured road users in the category of passenger car.
- The social costs per road fatality, severe and light injury are valued at 2,148,034€, 273,574€, and 51,373€, respectively, in Greece (ITF, 2020).
- An average 30% reduction in road casualties is assumed, based on literature (as cited in the Introduction).

Fuel Consumption

- The average annual fuel consumption (litres per vehicle-kilometre) for the Greek passenger car fleet by 2030 is considered, based on EU targets (Yang & Bandivadekar, 2017).
- Fuel consumption effect is estimated, considering the fuel cost, the annual vehicle-kilometres travelled on Greek roads, and the average fuel consumption.
- An average 5% reduction in fuel consumption is assumed, based on literature (as cited in the Introduction).

Travel Time

- The travel time effect is estimated considering the number of insured passenger cars in Greece, an average car occupancy rate of 1.2 (Eurostat, 2023), the annual travel time on Greek roads, and a value of travel time (VOT) at 5.6€/hour (EC, 2019; Eurostat, 2021).
- The potential increase in travel time because of the speed reduction resulting from the improvement in driving behaviour was conservatively considered equal to 2% (Kontaxi et al., 2021).

Environment

- The environmental effect was computed considering the annual vehicle-kilometres travelled, the CO_2 emissions per vehicle-kilometre, and the social cost of CO_2 (€/tonne) (EIB, 2020; EC, 2021).

- An average 5% reduction in CO_2 emissions is assumed, based on the international literature (as cited in the Introduction).

State Grant

- The State Grant is estimated for each Scenario, considering the Safe Pass value and the number of Safe Passes in each Scenario.

Considering the required State Grant and the socio-economic effects of the implementation of the recommended policy, the Internal Rate of Return (IRR), the present value of economic benefits (PV), and the NPV are estimated. The costs and benefits arising at different times are discounted using the Social Discount Rate (SDR) which is considered equal to 0.8% (EC, 2021) (Table 7.1).

Table 7.1 Social CBA for the implementation of telematics insurance policies in Greece

Scenarios	*S1*	*S2*	*S3*	*S4*
Safe Pass Value	**50€**	**55€**	**60€**	**70€**
Annual Safe Pass Offer	**0.7 mil**	**1.5 mil**	**2.5 mil**	**3.5 mil**
Total State Grant (2024–2030)	**−225 mil€**	**−533.5 mil€**	**−960 mil€**	**−1,575 mil€**
State Grant (2024)	15 mil€	38.5 mil€	60 mil€	105 mil€
Annual State Grant (2025–2030)	35 mil€	82.5 mil€	150 mil€	245 mil€
Change in socio-economic indicators (2024–2030)				
Light Injured (persons)	−1,331	−2,841	−4,669	−6,560
Severe Injured (persons)	−62	−131	−219	−307
Fatalities (persons)	−75	−158	−261	−364
Fuel Consumption (litres)	−121 mil	−270 mil	−450 mil	−636 mil
CO_2 Emissions (tonnes)	−0.3 mil	−0.6 mil	−1 mil	−1.5 mil
PV (0.8%)	**320 mil€**	**685 mil€**	**1,134 mil€**	**1,590 mil€**
NPV (0.8%)	**100 mil€**	**164 mil€**	**197 mil€**	**55 mil€**
IRR	**52.7%**	**35.3%**	**24.3%**	**4.8%**

Note 2024 indicators multiplied by 75% due to the policy application post the first quarter

It is concluded that in all Scenarios, there is a significant reduction in road injuries and fatalities and a significant environmental benefit. Specifically, the positive NPV and the high IRR (5% < IRR < 53%), *indicate the socio-economic feasibility of the policy recommendation in Greece for all examined Scenarios*. In case that the main criterion is the minimization of the State Grant, Scenario S1 is the preferred one. In terms of socio-economic performance, S3 is the preferred one as it demonstrates the highest NPV and a high IRR index (24.3%). In case that the main criterion is the maximisation of the social and environmental impact, which is the main motivation for this policy, S4 is the preferred one. Extrapolating the results of the CBA in Greece, to EU and all vehicles, the recommended policy could result to 740–4,440 less road fatalities per year in EU, depending on the level of the financial incentives.

It is highlighted that the recommended policy refers to all vehicles, whereas the CBA refers only to passenger vehicles; therefore, the potential societal and environmental benefit could be even higher. Also, *the current methodology can be applied to other countries* intending to adopt this policy recommendation by adjusting key parameters such as Safe Pass values, average vehicle insurance premiums, public acceptability through stated preference surveys, social cost per road casualty, VOT, and other relevant factors.

Conclusion and Recommendations

This chapter underscores the *critical importance of addressing road safety, climate change, and, energy consumption* as pressing global challenges. This can be achieved for the transport sector via the promotion and wide use of vehicle telematics through the provision of financial incentives and benefits by the State for vehicle insurance policies using telematics.

The provision of financial incentives and benefits by the State for vehicle insurance policies using telematics is proposed across the EU member states. The recommended policy introduces a new innovative approach in road safety, that is mainly based on safe behaviour, and not in the traditional, until now, approach of punishment.

To *assess the socio-economic feasibility of this policy*, a comprehensive social CBA was conducted, with a focus on a case study in Greece. Four alternative scenarios, each offering different levels of financial incentives, were examined, along with a "do-nothing" scenario as a baseline reference point. The results highlight that in all Scenarios there are significant

societal and environmental benefits, with a significant reduction in road casualties, fuel consumption, and CO_2 emissions, as well as positive socio-economic indicators. It is important to acknowledge that, while CBA provides valuable insights, its results are subject to underlying uncertainties and assumptions, especially given the long-term analysis time horizon. Therefore, conducting sensitivity analysis is crucial for robust policy formulation and decision-making. Naturally, updating the CBA forecasts as the time-period runs and adding more detailed layers as they become available is a fruitful way to navigate any uncertainty.

Collaboration across diverse disciplines is essential for the design, implementation, and evaluation of the proposed policy recommendation. An integrated approach, involving experts in transportation engineering, economics, psychology, and legal disciplines, is pivotal for defining financial incentives, developing a social CBA to assess the policy feasibility, measuring societal response, and ensuring compliance with EU privacy regulations.

More thorough and tailored upscaling of the present findings across an EU level can potentially be more fruitful than present results at a national level. Specifically, *the provision of financial incentives and benefits for vehicle insurance policies using telematics should be adopted as a policy at the EU level*, to maximise the societal and environmental benefits. Such policy should be accompanied by CBA studies, either at an EU or at a national level, considering the societal, environmental, and macroeconomic indicators of the EU members in order to define the optimum value of financial incentives (Safe Pass) and benefits per country.

This EU policy should also be supported by a centralised EU fund that will be available for each country (on the top of any national funds that may be provided by each country) and it will be specifically dedicated to the promotion of telematics via insurance policies so that EU can achieve its targets related with road crashes by 2030. In summary, the provision of financial incentives and benefits in the insurance policies using telematics serves as a strategic approach for all EU members, aligning with the EU Green Deal and seamlessly contributing to Vision Zero targets, and promoting sustainable mobility.

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