USAGE-BASED INSURANCE: NUDGING TOWARDS RESPONSIBLE DRIVING

by

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DECLARATION

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ABSTRACT

The ramifications of South Africa's poor road safety record extend far beyond physical- and emotional trauma by piercing a proverbial puncture of considerable consequence in the nation's economy. Each year, road accidents impose a socio-economic burden equivalent to more than three percent of the country's gross domestic product. As such, there is little doubt that priority should be placed on interventions that may mitigate accident risks. The research presented in this document investigated one such intervention—usage-based vehicle insurance. Two research avenues were pursued; (1) a market segment assessment survey that probed young motorists' perceptions of usage-based insurance policies and (2) a case study analysis that explored the compulsory insurance arrangement of South Africa as well as that of some of the country's international counterparts.

The results of the survey revealed three sub-segments in the broader market segment of young drivers—each with different levels of interest in- and perceptions of usage-based insurance policies. Among the sub-segment dubbed *Forerunners*, respondents typically showed greater receptivity towards usage-based insurance and shared a stronger belief in its potential benefits. Those dubbed *Laggards* were generally more cynical towards these policies, while *Non-Partisans* often expressed sentiment somewhere between that of the other sub-segments. Despite most respondents regularly using insured vehicles, prior awareness of the existence of usage-based insurance was modest. Most respondents believed in the potential of usage-based insurance to encourage speed limit compliance and engender positive road safety outcomes, however, the curtailment of vehicle-kilometres travelled appeared to be a tall order for much of the sample. High levels of digital competence suggested that the segment as a whole would have little difficulty in adopting the hardware and software typically associated with modern usage-based insurance policies. Many respondents were, however, somewhat hesitant towards location monitoring—especially when fulfilled using mobile applications. Nearly half of all respondents shared an inclination towards flat-rate tariffs over variable tariffs, even when the latter would be cheaper over the long-term—a somewhat surprising stance that spanned across all three sub-segments.

In the second research avenue, the perspective shifted to that of the state and the focus was broadened to explore national compulsory insurance arrangements. South Africa's Road Accident Fund finds itself in dire need of restructuring if it is to escape its liability-ridden financial position. This, combined with the recent binning of the scheme's proposed replacement, raises uncertainty over the state's plans for its insurance arrangement. With an eye towards highlighting the challenges that South Africa may face if it were to adopt an alternative arrangement, this research avenue introduced the compulsory insurance arrangements of a collection of nations and considered their core challenges. The case study also explored these nations' efforts to better reflect the user-pays principle by allowing a greater degree of risk-based tariff differentiation in their compulsory insurance arrangements. This drew attention to the diverse nature of nations' insurance arrangements and, in doing so, exhibited that no single approach should necessarily be seen as a panacea.

OPSOMMING

Die gevolge van Suid-Afrika se swak padveiligheidsrekord strek veel verder as fisieke en emosionele trauma deurdat dit ’n spreekwoordelike pap band met aansienlike gevolge vir die land se ekonomie veroorsaak. Padongelukke veroorsaak elke jaar ’n sosio-ekonomiese las gelykstaande aan meer as drie persent van die land se bruto binnelandse produk. As sulks is daar min twyfel dat intervensies wat ongeluksrisiko’s kan verminder, prioriteit moet geniet. Die navorsing wat in hierdie dokument aangebied word, het een so ’n intervensie ondersoek—gebruiksgebaseerde voertuigversekering. Twee navorsingsmetodes is gevolg: (1) ’n marksegment-assesseringsopname wat jong motoriste se persepsies van gebruiksgebaseerde versekeringspolisse ondersoek het en (2) ’n gevallestudie-analise wat die verpligte versekeringsopset van Suid-Afrika, sowel as sommige van die land se internasionale eweknieë, verken het.

Die resultate van die opname het drie subsegmente in die breër marksegment van jong bestuurders aan die lig gebring—elk met verskillende vlakke van belangstelling in en persepsies van gebruiksgebaseerde versekeringspolisse. In die subsegment wat die naam *Voorlopers* gegee is, het respondente tipies groter ontvanklikheid getoon teenoor gebruiksgebaseerde versekering en ’n sterker oortuiging gedeel ten opsigte van die potensiële voordele daarvan. Dié wat *Talmers* genoem is, was oor die algemeen meer sinies teenoor hierdie polisse, terwyl *Onpartydiges* dikwels uitdrukking gegee het aan ’n sentiment êrens tussen dié van die ander subsegmente. Ten spyte daarvan dat die meeste respondente gereeld gebruik gemaak het van versekerde voertuie, was ’n vooraf bewustheid van die bestaan van gebruiksgebaseerde versekering beperk. Die meeste respondente was oortuig van die potensiaal van gebruiksgebaseerde versekering om gehoorsaamheid aan spoedbeperkings aan te moedig en positiewe padveiligheidsuitkomste mee te bring, maar die beperking van voertuig-kilometers gery, het geblyk moeilik te wees vir ’n groot deel van die steekproef. Hoë vlakke van digitale bekwaamheid het daarop gedui dat die segment as geheel maklik die hardeware en sagteware sou kon aanneem wat tipies geassosieer word met moderne gebruiksgebaseerde versekeringspolisse. Baie respondente was egter ietwat huiwerig oor liggingskontrolering – veral wanneer dit uitgevoer word deur middel van mobiele toepassings. Byna die helfte van alle respondente het ’n voorkeur vir vaste tariewe bo wisselende tariewe getoon, selfs wanneer laasgenoemde goedkoper sou wees oor die lang termyn – ’n ietwat verrassende standpunt wat by al drie subsegmente voorgekom het.

In die tweede navorsingsmetode het die perspektief verskuif na dié van die staat en is die fokus uitgebrei om nasionale verpligte versekeringsopsies te verken. Suid-Afrika se Padongelukkefonds benodig dringende herstrukturering om ’n skuldbelaaide finansiële posisie te ontsnap. Dit, tesame met die verwerping van die skema se voorgestelde vervanging, bring onsekerheid mee oor die staat se planne vir sy versekeringsopset. Met die oog daarop om die uitdagings uit te lig wat Suid-Afrika in die gesig mag staar indien die land ’n alternatiewe stelsel sou aanneem, het hierdie navorsingsmetode die verpligte versekeringsopsies van ’n aantal lande ondersoek en hulle kern-uitdagings oorweeg. Die gevallestudie

verken ook hierdie lande se pogings om die gebruiker-betaal beginsel beter te reflekteer deur ’n groter mate van risiko-gebaseerde tariefdifferensiasie in hul verpligte versekeringsopsies toe te laat. Dit vestig die aandag op die diverse aard van lande se versekeringsopsies en sodoende gewys dat geen enkele benadering noodwendig gesien moet word as ’n wondermiddel nie.

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Soli Deo Gloria.

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LIST OF ABBREVIATIONS & UNITS

Abbreviation/Unit	Meaning
µg/m^3	Micrograms per cubic metre of air
AA	Automobile Association
ACC	Accident Compensation Corporation
ADAS	Advanced driver-assistance systems
B2B2C	Business-to-business-to-consumer
BEV	Battery electric vehicles
CBIRC	China Banking and Insurance Regulatory Commission
CNY	Chinese Yuan
CO_2	Carbon dioxide
COVID-19	Coronavirus Disease 2019
CSIR	Council for Scientific and Industrial Research
CSV	Comma-separated values
DESC	Departmental Ethics Screening Committee
DoT	Department of Transport
EEA	European Economic Area
ESC	Electronic stability control
EU	European Union
EUR	Euro
GDP	Gross Domestic Product
GHG	Greenhouse gas
GPS	Global positioning system
GST	Goods and Services Tax
GWP	Gross written premiums
HEV	Hybrid electric vehicle
ICE	Internal combustion engine
km	Kilometre(s)
MID	Motor Insurance Directive
MTPL	Motor third-party liability
MVA	Motor Vehicle Account
NATMAP	National Transport Master Plan
NIB	National Insurance Bureau
NZD	New Zealand Dollar
OECD	Organisation for Economic Co-operation and Development
OPEC	Organization of Petroleum Exporting Countries

PATP	Pay-at-the-pump
PAYD	Pay-as-you-drive
PHEV	Plug-in hybrid electric vehicle
POPIA	Protection of Personal Information Act
PwC	PricewaterhouseCoopers
RABS	Road Accident Benefit Scheme
RAF	Road Accident Fund
REC:SBE	Research Ethics Committee: Social Behavioural and Education Research
RTMC	Road Traffic Management Corporation
SAIA	South African Insurance Association
SARS	South African Revenue Service
SPSS	Statistical Package for the Social Sciences
SUV	Sport utility vehicle
TDM	Transportation demand management
UBI	Usage-based insurance
UHI	Urban heat island
USD	United States Dollar
VAT	Value-added tax
VKT	Vehicle-kilometres travelled
WHO	World Health Organization
ZAR	South African Rands

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1 INTRODUCTION

Motorists in South Africa are regularly exposed to risk levels that, when compared globally, appear inconceivably high. In 2019 alone, a sobering 12,503 road users lost their lives on South Africa's roads (RTMC, n.d.). In 2016, the country's per-capita road traffic mortality rate exceeded that of high-income countries by approximately three times, on average (WHO, 2018). Road traffic accidents come at a cost that extends far beyond human suffering—placing a burden on the country's economy equivalent to ZAR 142.95 billion in 2015 (Labuschagne, 2016:36). Equivalent to 3.4 percent of the country's gross domestic product (GDP), this is a burden that South Africa's under-strain economy simply cannot bear. In response, the Department of Transport (DoT) has waged a proverbial war on the scourge of road accidents through interventions outlined in the National Road Safety Strategy 2016-2030. This strategic report emphasised the importance of interventions aimed at altering the behaviour of road users (DoT, 2017a), as human factors have been reported by the Road Traffic Management Corporation (RTMC) to be the outright leading cause of fatal road accidents (RTMC, 2017). Because of the clear necessity to prioritise human factors, the research undertaken explored one such intervention posited to incite desirable behavioural change among motorists—usage-based insurance (UBI) policies.

Conventionally, vehicle insurance premiums (i.e., periodic insurance tariffs) are charged on a flat-rate basis and are determined based on an array of driver- and vehicle factors that policyholders often have little control over in the short-term. As such, the tariff structures of conventional policies are unlikely to effectively encourage responsible driving behaviour among policyholders. Put aptly by Nobel Laureate William Vickery as far back as 1968, "the manner in which premiums are computed and paid fails miserably to bring home to the automobile user the costs he imposes in a manner that will appropriately influence his decision (Vickrey, 1968:7)."

UBI, also commonly referred to as pay-as-you-drive- (PAYD), distance-based- and per-kilometre insurance, diverges from traditional vehicle insurance in that premiums are influenced by the distance driven by the policyholder (Santos, Behrendt, Maconi, Shirvani & Teytelboym, 2010:26). Owing to this, insurance costs become variable (Litman, 2018:1), creating an opportunity for cost savings among policyholders who exhibit relatively modest vehicle usage. While integrating vehicle-kilometres travelled (VKT) into the risk profiles of policyholders represents a refinement over the rate-making practices of traditional policies, some insurers have taken vehicle monitoring a step further and incorporate other conduct that elevates driving risk, such as rapid acceleration and braking, sharp cornering, speeding and night-driving, into tariff setting processes. By creating a clear link between driving behaviour and premiums, it is thought that these modern UBI policies could incentivise policyholders to both limit their driving and improve the manner in which they drive, thereby eroding their exposure to risk (Litman, 2018). Through encouraging desirable driving behaviour and curtailed

VKT, it has been said that insurers create opportunities for value to be derived by themselves, policyholders, government and broader society—a term often referred to as *shared value*.

1.1 Research Focus

The thesis explored two broad research avenues relating to UBI, each with noteworthy implications for insurers and the South African government. The first avenue took the perspective of insurers and involved a market segment assessment survey that explored young drivers' perceptions of UBI policies and their widely-posited benefits. The subsequent research avenue took the perspective of the state and involved the use of a case study approach to explore the merits- and challenges associated with a potential alteration of the country's existing insurance arrangement, as well as the scope for integrating usage-based principles into future arrangements.

Despite considerable adoption of behaviour-based vehicle insurance policies in parts of the developed world and early indications of popularity among a handful of South African UBI offerings, the number of UBI options available to consumers in the local market remains limited. This apparent lag may be rooted in a lack of willingness among local insurers to alter existing business models and legacy systems (Moodley, 2019:10), perhaps underpinned by concerns of how the local market would react to significant changes in the way that vehicle policies are structured. Studies that reveal a strong appetite among the local market for UBI policies may subdue insurers' concerns and prompt them to sate the demand. In nations with more-mature UBI offerings, including Italy and the United Kingdom, the appeal of potential premium savings for young drivers has made this segment a driving force behind the proliferation of UBI policies (Insurance Europe, 2019:22). In addition, members of this burgeoning segment—characterised by lifelong exposure to digital technologies—have skills, expectations and buying preferences that differ from those of their more-mature counterparts (PwC, 2018:28). As such, the perceptions of UBI policies held by these "digital natives" should be of particular importance to local insurers. Because research relating to UBI in the South African context—particularly with a focus on younger motorists—is scant, the market segment assessment survey aimed to take exploratory steps towards addressing this knowledge gap. To this end, a broad array of relevant themes were investigated among a group of 565 motorists between the ages of 18 and 34. In doing so, the survey gathered insights relating to the youthful segment's price-consciousness, sentiment towards the proposed benefits of UBI, digital readiness and perceptions of alternative means of travel.

In the subsequent research avenue, the viewpoint of the study shifted from private insurers to that of the state. South Africa is somewhat anomalous in its use of a compulsory ring-fenced fuel levy as a means to fund a single state-run insurer with the responsibility of providing personal injury coverage relating to road accidents. In the existing overarching insurance arrangement (i.e., that which relates to both personal injury- and property coverage), coverage relating to property is optional and provisioned by the private sector. In much of the rest of the world, motor third-party liability (MTPL) insurance is

compulsory[1] and sold by private insurers. Despite collecting most of its revenue from a source with inherent universal compliance, South Africa's public insurer—the Road Accident Fund (RAF)—has found itself in a seemingly inescapable- and swelling state of insolvency. Persistent cash constraints and a litigious claims environment have also hindered the entity's ability to compensate accident victims timeously (DoT, 2010; RAF, 2020a,b). As such, under the entity's existing operating model, the efficacy and long-term continuity of the RAF appear to be in jeopardy. In response, as part of the then-Minister of Finance's 2020 Budget Speech, the possibility of an altered compulsory insurance arrangement was put forward (Mboweni, 2020). The exploratory case study sought to elucidate the core challenges associated with the RAF's existing operating model, as well as explore the compulsory insurance arrangements of other nations with an eye towards highlighting the challenges that South Africa *may* face if it were to alter its current arrangement. While no nations have enforced the adoption of UBI, it has been suggested that the combination of this type of policy and the taxation thereof could hold particular merit in internalising the costs of road accidents (van Essen, Nelissen, Smit, van Grinsven, Breemersch, Martino, Rosa, Parolin & Harmsen, 2012:11). As such, some national governments, such as that of Italy, have made active attempts to boost the proliferation of UBI policies. Accordingly, the case study also set out to consider the scope for adopting usage-based principles as part of future road accident insurance arrangements in South Africa.

1.2 Aims and Objectives

Because two research avenues were pursued—each taking the perspective of different stakeholders—the study sought to achieve two distinct research aims that relate to UBI. The first of these aims prioritised the perspective of insurers and related specifically to UBI in the context of South Africa's existing overarching insurance arrangement, which confines UBI products to the market for voluntary property coverage. The second aim shifted the perspective to that of the South African state and broadened the focus to the country's overarching insurance arrangement, which includes both property- and personal injury coverage. The research aims are expressed formally as follows:

Aim 1: Explore the perceptions of usage-based insurance held by relatively young motorists in South Africa to gauge the local segment's willingness and ability to adopt these less-traditional vehicle insurance policies.

Aim 2: Based on international experience, consider the potential merits and challenges of altering the existing vehicle insurance arrangement of South Africa, as well as the scope for adopting usage-based principles as part of the nation's vehicle insurance arrangement.

[1] In most nations, third-party personal injury coverage is mandated. Some nations, including many in Europe, also require motorists to take out coverage against third-party property damages (The European Parliament and the Council of the EU, 2009).

Attaining an array of sub-objectives aided in accomplishing the overarching aims, which ultimately underpinned wide-ranging discussions and uncovered several avenues for future research. The first four objectives relate to the first primary aim, while the remaining objectives relate to the second primary aim.

Objective 1: Explore the degree of price-consciousness exhibited by younger drivers in relation to the insurance policies that cover the vehicles that they use most regularly.

Gauging motorists' responsiveness to price changes would inform suggestions on how strongly the potential for achieving premium savings should be emphasised in the marketing strategies and pricing structures of UBI policies. Furthermore, it was thought that the opportunity afforded by UBI to take cost-savings into policyholders' own hands by exhibiting desirable driving behaviour might resonate particularly strongly with price-conscious consumers.

Objective 2: Investigate the extent to which younger motorists believe that UBI policies could create shared value by encouraging cost savings, improved speed limit compliance and reductions in driving.

The purpose of this objective was to gauge whether younger motorists generally believed that UBI policies could engender benefits for policyholders as well as broader society. This assisted in drawing conclusions about younger motorists' likelihood of buying into these less-traditional insurance policies.

Objective 3: Survey the willingness and ability among younger motorists to operate the hardware and software usually associated with modern UBI policies.

Because policyholders are often required to use technology such as smartphone applications and global positioning system (GPS) devices to fully leverage the benefits and features offered by modern UBI policies, this objective aimed to explore the willingness and ability of younger individuals to subscribe to- and utilise more-digitally-demanding policies.

Objective 4: Explore the perceptions of younger motorists towards public transport as a potential alternative to private vehicle use.

Because of the derived nature of demand for transport, merely incentivising reduced VKT would not necessarily influence an individual's need to undertake routine trips. Alternative commuting options, such as public transport, carpooling and e-hailing services, may, however, provide opportunities for savings under UBI policies. Concerningly, in the South African context, it has been argued that individuals actively aspire to move away from the use of public transport (Simpson, Mckay, Patel, Sithole, Van Den Berg & Chipp, 2014). This objective attempted to assess the likelihood of modal shifting—particularly from private vehicles to public alternatives—among younger motorists.

Objective 5: Investigate the parallels and dissimilarities between South Africa's road accident compensation scheme and the current compulsory road accident insurance arrangements of its international counterparts.

The pay-at-the-pump (PATP) funding arrangement of the RAF makes South Africa's road accident compensation scheme innately distinctive from that of most nations. Juxtaposing South Africa's insurance arrangement against that of other nations served to highlight the sui generis nature of the RAF.

Objective 6: Consider the core challenges associated with the existing operating model of South Africa's compulsory road accident compensation scheme.

According to the RAF itself, the funding- and compensation components of the entity's existing operating model have been the driving forces behind its long-term financial challenges (RAF, 2020a,b). While the entity's PATP funding model makes for an administratively simple means of revenue collection and guarantees universal compliance among motorists, the entity faces core challenges that are underpinned by its reliance upon charges levied on fuel sales. In addition, the litigious claims environment in which the RAF operates has significant implications for the entity's delivery costs and turnaround times. The thesis sought to draw attention to the RAF's core operating challenges with the intention of encouraging further research on potential remedies.

Objective 7: Explore the core challenges faced by South Africa's international counterparts as a result of their compulsory road accident insurance arrangements.

Although calls for some form of compulsory third-party vehicle insurance have been echoed persistently by the short-term insurance industry (SAIA, 2019:27), existing arrangements of this nature vary greatly between nations and are not without challenges. As such, the case study sought to assemble and discuss the complications that other nations have faced as a result of their varied compulsory vehicle insurance arrangements. In doing so, the study aimed to highlight *potential* issues that South Africa *may* experience if the state were to adopt similar approaches.

Objective 8: Review attempts made by South Africa's international counterparts to integrate usage-based principles into their compulsory insurance arrangements.

Although no states have mandated UBI, this type of policy arguably reflects motorists' risks more objectively than what traditional rate-making factors could do in isolation and, as a result, has been suggested as a means to hold motorists accountable for the risks that they pose (van Essen *et al.*, 2012:11). Because of their potential to deliver cost savings to policyholders, it has also been proposed that these policies could improve access to insurance and, in doing so, reduce the proportion of uninsured vehicles. As such, some nations, such as Italy, have enacted regulations aimed at encouraging the voluntary uptake of UBI policies. This objective sought to explore these international cases with an eye towards adopting similar strategies to promote the proliferation of UBI in South Africa.

1.3 Thesis Structure

This document begins with an extensive overview of existing literature, which includes an introduction to the external costs associated with private road transport, an exploration of UBI policies, an overview of closely related market assessment surveys, as well as a reiteration of the importance of the youthful market segment. This is followed by a research overview, which provides a high-level graphical representation of the study. The fourth chapter relates to the market segment assessment survey and includes both the methodology adopted and the results obtained. The subsequent supplementary chapter brings together lessons learnt from the survey and the findings of existing behavioural research to provide insights with applicability in the context of vehicle insurance. In Chapter 6, the focus is widened to South Africa's overarching insurance arrangement, which relates to both property- and personal injury coverage. This exploratory chapter elucidates challenges associated with South Africa's existing road accident compensation system before exploring the insurance arrangements of some of South Africa's international counterparts. Because of the exploratory nature of the study, a host of potential research opportunities were identified. As such, the penultimate chapter of the thesis proposes several recommended research avenues. Chapter 8 brings the thesis to a close with a high-level overview of the study and its findings.

2 LITERATURE REVIEW

The literature review is divided broadly into five sections. With the intention of highlighting the need for interventions that bring about a more efficient allocation of resources within the road transport sector, the first section of the literature review concerns the external costs linked to private road transport. The subsequent section provides an overview of UBI policies in terms of their benefits, their variations and possible challenges that may be encountered in their implementation. This is followed by a broad overview of South Africa's market for vehicle insurance. Subsequently, the results of surveys that aligned closely with that of this study are explored. The final section of the literature review addresses the importance of the relatively young UBI market segment.

2.1 The Negative Externalities of Private Road Transport: A Ballooning Burden

By offering an ongoing incentive to adopt responsible driving behaviour and curtail VKT, it is commonly asserted that UBI could erode policyholders' exposure to road accident risks (Litman, 2018). While this theoretical link between UBI and accident risk mitigation is intuitive, the potential reductions in VKT encouraged by their variable tariff structure may mean that the societal benefits associated with this type of policy could extend beyond reduced accident risks.

Apart from accidents, road transport is associated with a host of *negative externalities*, including environmental desecration, congestion, road damage and a detrimental reliance upon oil-based products (Parry, Walls & Harrington, 2007; Santos *et al.*, 2010). This section of the literature review begins with a succinct economic explanation of the theoretical origin of these external costs. This is followed by a run-through of the main external costs associated with road transport with reference to the South African context. In addition, some of the existing efforts to curb these externalities in the domestic context are outlined. By doing so, the section serves to highlight the importance of interventions that encourage VKT curtailment as well as the mechanisms currently employed to partially correct the market failures that give rise to negative externalities. Because vehicle insurance typically concerns the abatement of external costs linked to road traffic accidents, this particular type of externality is discussed in greater detail.

2.1.1 Theoretical Origin of External Costs and the Internalisation Thereof

External costs occur when the production or consumption of a particular good or service has an effect on a third party without corresponding compensation or accountability (van Essen, van Wijngaarden, Schroten, Sutter, Bieler, Maffii, Brambilla, Fiorello, Fermi, Parolin & El Beyrouty, 2019; International Monetary Fund, 2020). Before discussing each category of external cost associated with private road transport, it is worth briefly unpacking the theoretical economic reasons for the existence thereof.

Marginal costs refer to the changes in the total costs associated with unitary increases in the production or consumption of a particular good or service (Corporate Finance Institute, n.d.). When describing the

root of externalities, a distinction of principal importance should be made between marginal private costs and marginal social costs. While marginal private costs refer only to the incremental costs borne by the producer or consumer, marginal social costs include the marginal private costs as well as those costs not accounted for by the free market that are borne by third parties. A divergence between the marginal- private and social costs gives rise to external costs (Corporate Finance Institute, n.d.).

In the context of road transport, examples of marginal private costs include the incremental costs linked to vehicle operation, vehicle ownership, insurance and travel time. Since market prices in the road transport sector typically fail to reflect certain costs borne by society (i.e., environmental desecration, accidents, congestion, road damage and oil dependence), the use of road-based transport routinely exceeds what social optimality would dictate. This is because transport users do not typically consider external costs when making decisions relating to transport (van Essen *et al.*, 2019; Finger & Serafimova, 2019). The externalities associated with unchecked private vehicle use hence present a textbook example of Hardin's (1968) *tragedy of the commons*, as each motorist's decision to undertake a trip is made in pursuit of their own self-interest, while motorists collectively inflict harm upon the environment, the road, non-motorists and each other without adequate economic reparation.

Because of the economic burden of external costs, it is generally accepted that some form of intervention is required to regulate certain activities and/or introduce these external costs into the decision frameworks of motorists. In doing so, these interventions aim to bring about an improved allocation of resources within the sector in question. This typically involves the use of either command-and-control policies, market-based interventions or a combination of both. Command-and-control policies utilise regulation[2] and the enforcement thereof to curtail externalities, while market-based interventions involve the alteration of economic incentives as an inducement for desirable behaviour change among agents (van Essen *et al.*, 2019; OECD, 2001). By altering market prices to reflect the social costs associated with an activity, market-based interventions are said to *internalise* the otherwise external costs. Mandatory vehicle insurance and the taxation thereof represents one such combination of command-and-control- and market-based approaches for internalising accident costs.

From a purely theoretical perspective, it is commonly asserted that optimal interventions ensure that motorists bear the full set of costs associated with vehicle use (i.e., marginal social costs) (Petrus, 2020). While this principle—known as the *user-pays principle*—has robust theoretical merit, the practical implementation thereof is particularly challenging in the context of road transport (Elvik, 1994). The marginal social costs associated with road use can, for instance, differ considerably based on a host of factors (Van Rensburg & Krygsman, 2019:1842), including traffic flow conditions, vehicle characteristics, road characteristics and the manner of vehicle use. As such, a price for road use that is both uniform and optimal does not exist. Instead, optimal pricing interventions would be individually

[2] These regulations often come in the form of limits on activities and standard setting.

differentiated to reflect the heterogeneity in road users' circumstances (Van Rensburg & Krygsman, 2019:1842). As such, the optimal calculation- and subsequent allocation of marginal costs among road users is not necessarily practicable but should represent a theoretical point of departure for interventions that aim to internalise road-based externalities.

2.1.2 Road Traffic Accidents

In 2016 alone, the World Health Organization (WHO) estimated that road traffic accidents were responsible for the death of as many as 1.35 million individuals globally, making them the eighth leading cause of mortality among all age groups and the primary cause of mortality among individuals aged 5-29 years (WHO, 2018:5). Despite South Africa boasting an assemblage of relatively robust road safety laws that, to a large extent, align coherently with international best practices (Du Plessis, Jansen & Siebrits, 2020), the country's road accident statistics remain a cause for concern. This is reflected in Figure 2.1, which depicts the number of fatal road accidents and road accident fatalities in South Africa between the years 2000 and 2018. As part of the National Road Safety Strategy (2016-2030), the DoT aims to halve the number of lives lost on the country's roads between 2010 and 2030 (DoT, 2017a:46).

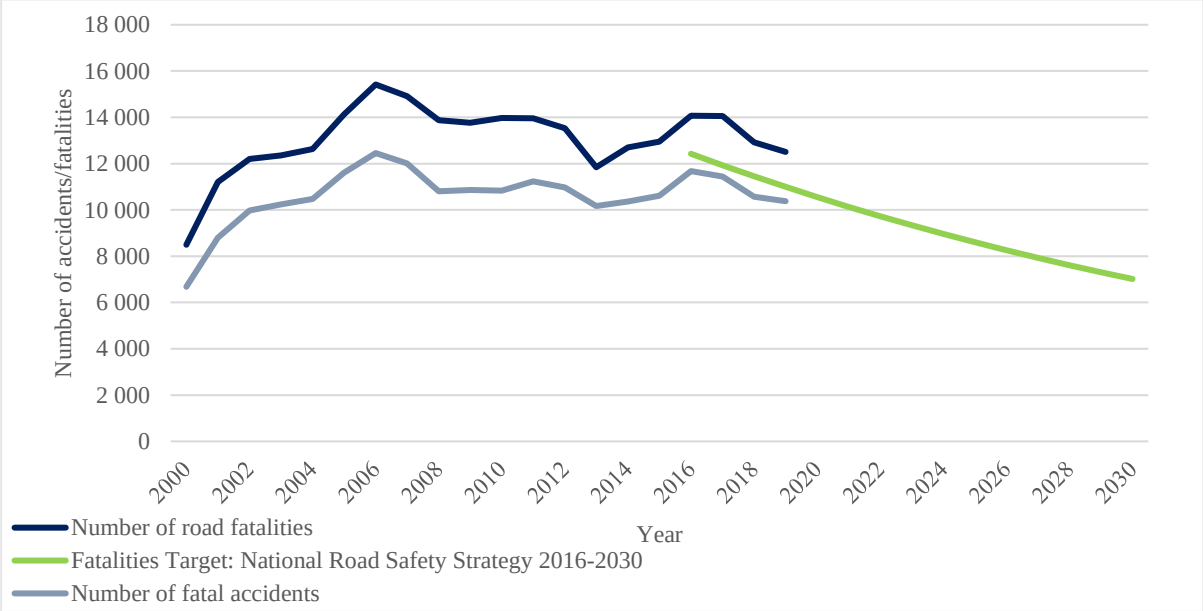

Figure 2.1: Number of road fatalities and fatal road accidents in South Africa (2000 onwards). (Source: Arrive Alive, 2001; DoT, 2017a; OECD, 2017; RTMC, n.d.)

After a sharp increase in fatalities between 2000 and 2006, the country's road safety record would appear to have improved gradually, however, the annual milestones that form part of the safety strategy's long-term goal have all been missed, implying that the progress made to date has left much to be desired.

Once growth in the vehicle fleet and population are considered—shown in Figures 2.2 and 2.3 respectively—the progress in road safety since 2006 appeared more encouraging. Included on the secondary axis of Figure 2.2 is the average severity of each year's fatal accidents (i.e., the average number of lives lost per fatal accident). Despite this progress, the DoT is in no position to rest on its

laurels. South Africa's death rate per 100,000 inhabitants ranked 136th out of 175 countries and remained approximately 38 percent higher than the equivalent world average estimated by the WHO in its most recent report on road safety (WHO, 2018). In 2018, when South Africa's traffic accident mortality rate per 100,000 inhabitants was 22.4, the equivalent average death rate in the European Union (EU) was 4.9 (OECD, 2019:2)—a stark reminder of how much progress is still required before the country can match up to leaders in road safety.

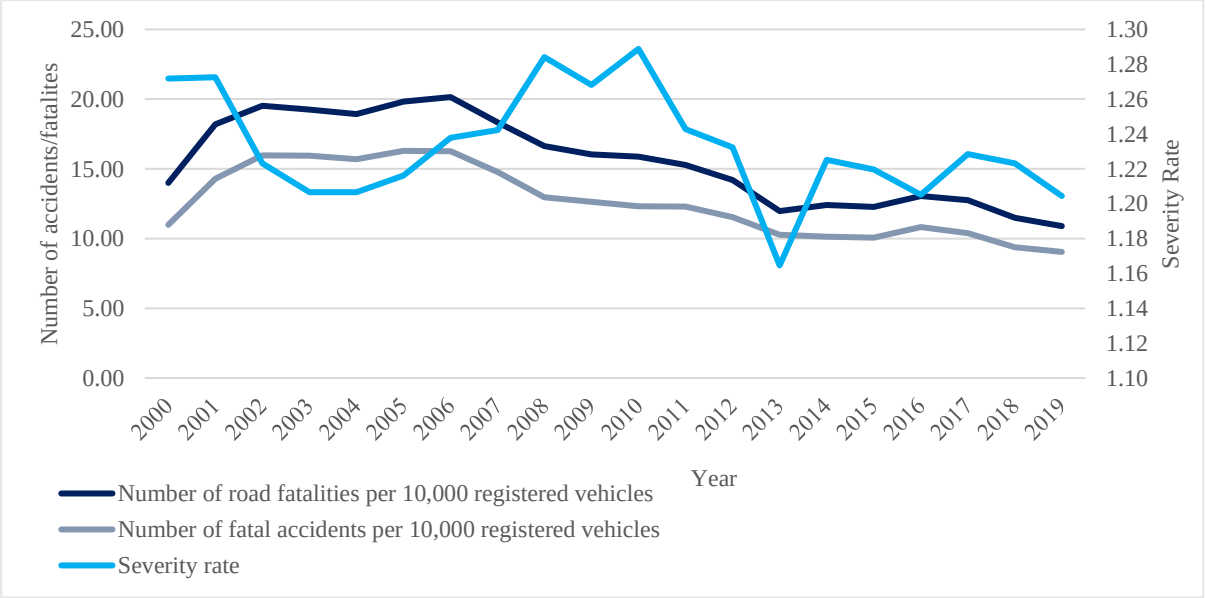

Figure 2.2: Number of road fatalities- and fatal road accidents (per 10,000 registered self-propelled vehicles) in South Africa (2000-2019).

(Source: Own calculations from Arrive Alive, 2001; eNaTis, n.d.; RTMC, n.d., n.d.)

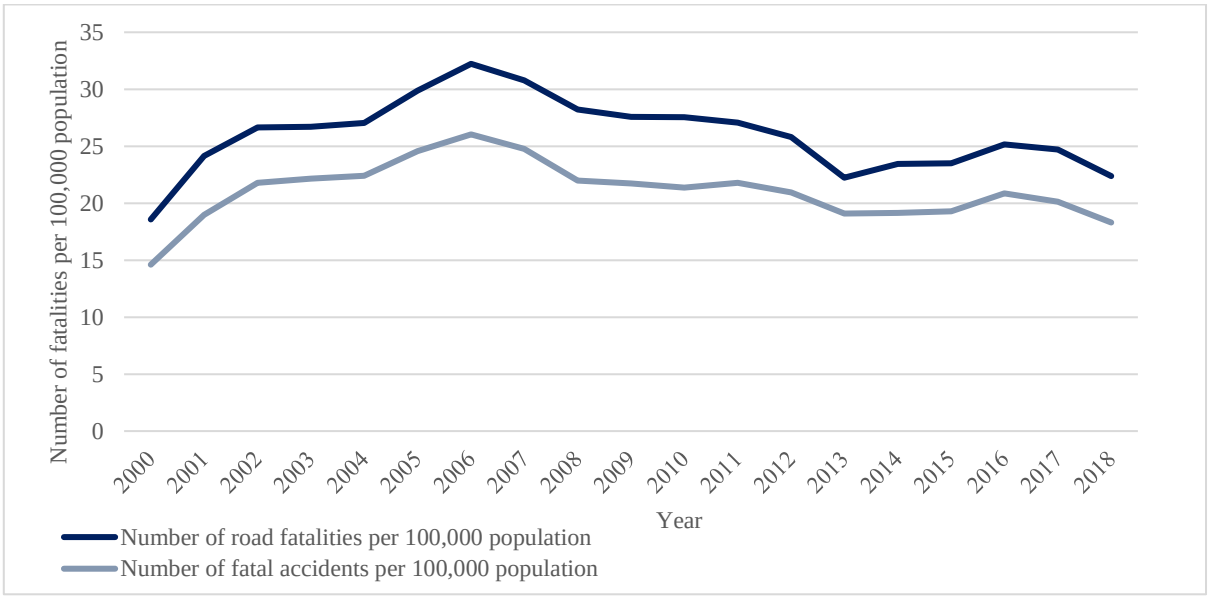

Figure 2.3: Number of road fatalities- and fatal road accidents (per 100,000 population) in South Africa (2000-2018).

(Source: Own calculations from Arrive Alive, 2001; OECD, 2017, n.d.; RTMC, n.d.)

Beyond human suffering, road- injuries and fatalities place a burden on victims, their relatives and, ultimately, the economy as a whole through the incurrence of rehabilitation- and repair costs as well as lost productivity. As mentioned in the opening chapter, it was estimated that domestic road traffic accidents took a toll equivalent to 3.4 percent of the country's GDP in 2015 alone (Labuschagne, 2016:36). A categorisation used by the European Commission places the main costs associated with traffic accidents into five groups (van Essen *et al.*, 2019:38). *Human costs* include the immaterial costs of accidents, such as grief, pain and suffering. Because of their immaterial nature, shadow prices are required to reflect these costs as a monetary value in accident cost estimates. *Medical costs* include all monetary costs associated with an accident victim's medical treatment and rehabilitation from the moment that the accident took place until complete recovery or fatality occurs. *Administrative costs* are the financial costs incurred to deploy non-medical emergency services, such as the police force and fire department, as well as legal- and insurance costs. *Production losses* refer to the reductions in productivity due to accident victims being either temporarily- or permanently unable to return to work, as well as the costs associated with replacing incapacitated workers. *Material damages* include the financial losses suffered due to damage to vehicles, personal property, infrastructure and freight as a result of accidents. Other costs incurred outside of these categories include funeral costs, the temporary increases in both congestion and emissions caused by accidents and the losses suffered due to vehicle unavailability.

Attaching a monetary value to the costs associated with a country's accidents remains a contentious issue, largely due to the incurrence of immaterial costs, as well as the inherent requirement for a value to be placed on a life saved or life lost (Santos *et al.*, 2010). As a result of heterogeneity in the values adopted by different governments, making comparisons between countries' accident costs is also not always possible. The task is complicated further by unreported- or incorrectly recorded accidents—a particularly prevalent problem in developing countries that necessitates the use of assumed correction factors. In the context of South Africa, only fatal accidents and fatalities are currently recorded (Labuschagne, 2016:31). This presents difficulties for researchers, who have little choice but to rely on outdated historical data to estimate the number- and costs of non-fatal accidents of varying severity.

Table 2.1 provides a breakdown of the estimated average unit costs (at 2015 values) associated with traffic accidents of varying levels of severity in South Africa, as estimated by the Council for Scientific and Industrial Research (CSIR) on behalf of the RTMC. In accident cost estimates, immaterial costs and most material costs are typically assumed to be constant (i.e., the value ascribed to one accident is equivalent to that of any other accident), meaning that the marginal accident costs are viewed as equal to the average accident costs (European Conference of Ministers of Transport, 1998:66). Based on the methodology adopted by the CSIR, which used a somewhat similar cost categorisation to that used by the European Commission, close to 70 percent of the estimated costs linked to accidents related to human casualty costs.

Table 2.1: Unit costs of road traffic accidents of varying severity, South Africa (2015 values).

Cost grouping	Unit cost per Road Traffic Crash (ZAR)				
	Fatal	Major	Minor	Damage only	Any severity
Human Casualty Costs					
Productivity losses	2,878,177	217,253	29,504	2,094	55,331
Grief, pain, suffering, and impaired quality of life	2,123,994	287,173	47,509	-	49,842
Medical treatment and rehabilitation	147,143	110,656	32,681	-	12,509
Funeral costs	16,613	-	-	-	222
Workplace reoccupation	68,638	2,949	-	-	1,061
Human casualty cost sub-total	**5,234,565**	**618,031**	**109,694**	**2,094**	**118,965**
Incident costs					
Emergency response services	3,042	2,765	-	-	174
Legal costs	101,623	101,623	-	-	6,258
Vehicle related costs	3,107	3,197	3,469	4,251	4,060
Road traffic crash management	10,176	5,101	2,030	2,030	2,287
Damage to infrastructure	1,596	1,637	2,023	2,508	2,376
Congestion and emissions	61,547	13,140	13,140	10,829	11,987
Incident costs sub-total	**181,092**	**127,462**	**20,662**	**19,618**	**27,143**
Vehicle Repair Costs					
Vehicle repair costs	19,604	20,171	21,887	26,822	25,618
Vehicle repair costs sub-total	**19,604**	**20,171**	**21,887**	**26,822**	**25,618**
Total cost per accident	**5,435,261**	**765,664**	**152,244**	**48,533**	**171,727**

(Source: Labuschagne, 2016:35)

While the cost breakdown in Table 2.1 represented an attempt to express all accident-linked costs, it is worth noting that a portion of these costs would typically be considered internalised by drivers and insurers. For instance, costs that are covered by risk-oriented insurance are generally not viewed as external (van Essen *et al.*, 2019:38). As such, a portion of the total bill attributable to medical treatment, vehicle repairs and funerals might be considered internalised by means of insurance, for example. It might also be assumed that road users are aware that undertaking a particular trip could result in an accident, meaning that their own human costs are internalised (van Essen *et al.*, 2019:33), while those of other road users and the friends and families of victims are considered external. Based on the calculations of Labuschagne (2016), it was estimated that external costs represented approximately 24 percent of South Africa's ZAR 142.95 billion accident burden in 2015.

As introduced in the opening chapter, the RAF is a state-run insurer that provides coverage to all road users in South Africa against loss or damage due to death or bodily injury as a result of road traffic accidents. Per the RAF Act, 1996 (No.56 of 1996), the RAF provides indemnity coverage to those responsible for accidents, as well as personal injury coverage to victims of accidents or their families (Republic of South Africa, 1996). In the local context, the distinction between external- and internal accident costs, and the subsequent apportionment of internal costs between drivers and insurers is nuanced by the RAF's fault-based nature and the voluntary nature of vehicle property insurance. For example, because the RAF does not provide compensation for property damages, the material costs relating to an accident involving uninsured vehicles would typically be borne by the vehicle owners[3]. In addition, because the RAF operates according to a fault-based system, casualties of single-vehicle accidents are typically not covered[4]. As such, if a driver were to undertake an evasive manoeuvre to avoid colliding with a pedestrian and collides with a tree as a result, the driver would not necessarily be able to institute a claim. In this scenario, the vehicle owner may incur material costs and endure production losses without compensation, for instance. Property coverage also allows a portion of accident externalities to be internalised, however, the limited uptake of this type of optional coverage restricts the extent of cost internalisation.

Because the costs that are covered by insurance are typically considered internalised, the overarching insurance arrangement of a particular nation has an important role in the internalisation of accident costs. Moreover, by altering drivers' incentives, the premium structures of effective risk-based insurance policies could have an impact on drivers' willingness to engage in risky activities, potentially resulting in the curtailment of external accident costs through a reduction in both accident- likelihood and severity. Conversely, insurance tariffs that fail to reflect risk could create adverse incentives that discourage safe driving—a phenomenon known as moral hazard[5]. As such, insurers may have a role to play in both prevention (i.e. deterrence) and compensation. In addition, many nations employ taxation upon insurance premiums as a means to set an appropriate pricing signal and raise revenue (van Essen *et al.*, 2012)[6]. Because premiums are often already differentiated to reflect insurers' perceptions of risks, flat-rate taxation of premiums represents a relatively simple pricing signal that, to some degree, reflects risk[7].

[3] Claims relating to damaged property can, however, be instituted against at-fault drivers in court.

[4] Unless the accident occurred as a result of the negligence of the owner of the vehicle (such as inattention to necessary vehicle maintenance).

[5] In the context of insurance, moral hazard refers to a phenomenon in which an insured individual heightens their exposure to risk after obtaining coverage as a consequence of no longer bearing full responsibility for the associated outcomes.

[6] In some cases, these revenues are used to fund accident-related functions or accident prevention activities.

[7] The extent to which this signal actually reflects risk is inherently hinged upon how accurately the insurer predicts policyholders' risks and translates these risks into premiums.

As discussed in Section 2.1.1, pricing interventions that reflect the marginal social costs associated with road use are typically prescribed as optimal internalisation methods. In the case of internalising road accident costs, this would imply that an optimal road accident charge should reflect the marginal accident costs linked to driving. While interventions that perfectly reflect marginal accident costs are inherently impractical to implement (Elvik, 1994), these costs do represent a theoretical point of departure against which the intervention that is ultimately selected should be compared. A failure to reflect the marginal accident costs may bring about inappropriate funding levels for insurers and could have a detrimental impact on deterrence among motorists. In Chapter 6, South Africa's insurance arrangement and its ability to reflect marginal accident costs are explored from a theoretical perspective.

2.1.3 Environmental Desecration

Road transport and its associated infrastructure can be linked to a multitude of detrimental environmental effects. Among others, these include greenhouse gas (GHG) emissions, localised heating and noise pollution (Nieuwenhuijsen & Khreis, 2016; Santos *et al.*, 2010).

The WHO has estimated that air pollution is responsible for the untimely demise of approximately seven million people each year (WHO, n.d.). Ischemic heart disease, lower respiratory infections, lung cancer, stroke and chronic obstructive pulmonary disease are among the most common causes of premature mortality induced by air pollution (Nieuwenhuijsen & Khreis, 2016:255). Furthermore, air pollution linked to traffic has been shown to contribute to the prevalence of ailments such as diabetes, obesity, poor lung function and reduced cognitive function among children, low birth weight and other cardiovascular diseases (Nieuwenhuijsen & Khreis, 2016:256). Despite the health risks associated with air pollution, more than 80 percent of the world's urban dwellers live in areas where the WHO's pollution concentration guideline limit of 10 $\mu g/m^3$ is consistently exceeded (WHO, n.d.).

Emission levels of carbon dioxide (CO_2), the GHG that contributes most to global warming and an inherent by-product of fuel combustion (Santos *et al.*, 2010:6), are concerningly high in South Africa. In 2018, the country's CO_2 emissions from fuel combustion exceeded 427 million tonnes, making it the 13th largest national emitter of CO_2 worldwide. When expressed on a per capita basis, the country's annual CO_2 emissions of 7.4 tonnes exceeded the world average by close to 1.7 times in 2018 (International Energy Agency, 2021).

South Africa's transport sector is directly responsible for close to eleven percent of the country's total GHG emissions (DoT, 2018a:10), with the lion's share attributable to road transport (Department of Environmental Affairs, 2017:116). It has been predicted that direct GHG emissions from the transport sector would roughly double between 2000 and 2025 without the implementation of mitigation measures. Under the assumptions of this forecast, road transport's share of the total direct GHG emissions from transport would not fall below 84 percent at any point. The emissions caused by transport, however, extend beyond those associated with fuel combustion. When including the indirect

GHG emissions tied to transport, such as those from fuel refining, storage and distribution, the total GHG prediction for 2050 is 67 percent higher (Department of Environmental Affairs, 2014:8). Because of the extent of road transport's contribution to GHG emissions, this particular sub-sector offers the greatest potential for mitigation benefits and, as such, is the priority of the country's Green Transport Strategy for 2018-2050 (DoT, 2018a:18). The DoT has conceded that the carbon-intensive nature of the country's existing transportation model is "highly inefficient and unsustainable" and advocates for a shift to more energy-efficient modes of passenger transport (DoT, 2017b:7). As such, a host of short-, medium- and long-term interventions and principles aimed at reducing the demand for travel and encouraging modal shifts towards public transit and non-motorised transport were included in the National Transport Master Plan (NATMAP) 2050 (DoT, 2017b:8).

The carbon tax is a relatively new tax enacted as part of the country's response to climate change to corroborate the polluter-pays principle by internalising the negative externalities associated with GHG emissions. By altering the relative prices of goods and services based on their associated emission-intensities, this fiscal measure aims to incentivise producers and consumers to adopt more environmentally-friendly habits (DoT, 2018a:15). In mid-2019, a carbon fuel levy was introduced as an add-on to the general fuel levy as part of this broader carbon tax policy. The per-litre carbon fuel tax levied on petrol and diesel were ZAR 0.08 and ZAR 0.09 respectively for the 2021/2022 financial year (National Treasury, 2021). In addition to the carbon fuel levy, the South African government's fiscal policy on carbon emissions includes a once-off tax levied on the sale of all new vehicles that produce emissions in excess of specified thresholds. Because the carbon tax is not ring-fenced, the income generated is not necessarily ploughed back into green initiatives but is rather allocated to projects at the discretion of the National Treasury.

The urban heat island (UHI) effect is a common localised phenomenon experienced in urban settings where concrete and asphalt surfaces overpower open areas and vegetation, resulting in higher temperatures in urban areas than in their surrounding rural areas. In addition to the vegetation removal often associated with road infrastructure provision, the vehicles that utilise roads contribute further to the UHI effect by emitting anthropogenic heat through their exhaust pipes, resulting in particularly pronounced heating in areas with a strong reliance upon private vehicles (Nieuwenhuijsen & Khreis, 2016:254). The repercussions of the UHI effect include increased energy consumption for cooling needs, contributions to smog formation and air pollution, human discomfort, heightened morbidity risk and damage to urban ecosystems (Mohajerani, Bakaric & Jeffrey-Bailey, 2017:524). In one of the first studies of its kind in South Africa, it was found that traffic contributed 56.3 percent to the total anthropogenic heat emissions of the City of Durban (Padayachi, Thambiran & Jagarnath, 2018). This would suggest that changes in the way that transport is utilised in South African cities, such as reductions in VKT through prudent route planning or modal shifts to public transit, could provide significant relief from localised heating.

Noise pollution and its corresponding impacts on the well-being of society are becoming increasingly recognised and researched (Nieuwenhuijsen & Khreis, 2016:256). According to the WHO (1999), noise can be linked to several broadly defined categories of effects, including cardiovascular- and physiological effects, social- and behavioural effects, hearing damage, interference with communication, sleep interruptions, mental health impacts and cognitive performance impairment. Intuitively, the level of ambient noise linked to traffic is influenced by a host of factors (such as the volume, speed and composition of traffic), resulting in large local- and regional variation. Some attempts to quantify the impacts of noise have included the use of hedonic property value models (Parry *et al.*, 2007:383) and estimates of the potential years of life lost due to premature mortality or years of healthy life lost as a result of poor health (WHO, 2011).

2.1.4 Congestion

Traffic congestion occurs when a road segment's capacity (representative of supply) is exceeded by the demand for space on the same road segment at a given time, thereby suppressing mobility and invoking travel times that are relatively long and unpredictable (Cambridge Systematics, 2005). Furthermore, congestion can significantly aggravate the prevalence of other externalities, such as pollution emissions and road accidents (van Essen *et al.*, 2019:87). Challenges relating to congestion are compounded by the occurrence of *facility breakdown*—a temporary contraction in a road's overall capacity caused by drivers' attempts to forcefully join an already-congested traffic stream (Reed & Kidd, 2019:3).

The TomTom Traffic Index ranks 416 cities from 57 countries based on their respective congestion levels (TomTom, n.d.). The annual scores recorded between 2017 and 2019 by the South African cities that were included in this ranking are presented in Table 2.2. According to this particular measure of congestion, drivers in Cape Town could, on average, expect their journeys to take 32 percent longer during congested periods than during uncongested periods (when free-flow travel was possible) in 2019. In the same year, the average driver from the city spent approximately 154 extra hours in their vehicle as a direct result of congestion (TomTom, 2019a), leaving behind a regrettable dent in the city's potential productivity and bringing about heightened pollution and accident risks.

Table 2.2: TomTom Traffic Index (2019) for South African Cities.

Congestion Index				
City	**2017**	**2018**	**2019**	**World Rank (2019)**
Cape Town	32	31	32	101
Johannesburg	30	30	30	121
Pretoria	24	25	25	207
East London	21	20	22	249
Durban	20	18	19	314
Bloemfontein	12	12	13	402

(Source: TomTom, 2019b)

Placing a value on the cost of congestion conventionally involves making generalised assumptions about the value of- time and reliability—often dubious conjectures amid considerable heterogeneity in these values between members of the travelling population (Santos *et al.*, 2010:7).

In the NATMAP 2050, the alleviation of traffic congestion on South Africa's roads is considered to be a key priority over the medium- (2020-2030) to long-term (2030-2050) (DoT, 2017c:2). This is to be achieved through a national transportation demand management (TDM) strategy[8], as well as individual traffic congestion management plans for each metro. Although the specifics of these interventions are not elaborated on, congestion charging will likely form part of the national TDM strategy, as the development of guidelines for this type of intervention formed part of the NATMAP's proposed short-term plans (DoT, 2017c:3).

Despite the suggestion that congestion pricing might form part of South Africa's plans to curb the frequency and intensity of its city's traffic standstills, the country's most recent attempt to implement congestion pricing—Gauteng's infamous e-toll system—has been met with strong public resistance and the consequent need to make seemingly perpetual attempts at breathing life into the scheme (Khatleli, 2014; Kwadi, 2019). One such intervention was the *New e-toll Dispensation*, announced in May 2015, which consisted of several amendments to e-toll legislation to include mechanisms for tariff reductions and methods of enforcing the settlement of outstanding charges (SANRAL, 2015). Despite these efforts to salvage the scheme, its future remains in considerable doubt. The relentless opposition faced by the scheme, whether justified or not, could perhaps be a sign of things to come if carbon-copy attempts to implement congestion pricing are implemented elsewhere in the country.

2.1.5 Road Damage

Damage to roads is caused, in part, by the vehicles that use them, thereby hastening the frequency with which road maintenance is necessitated. The extent of this damage is hinged upon characteristics of the road (such as whether its surface is paved or unpaved) and of the vehicles that use the roads (Newbery, 1988:297), as well as external influences such as the weather (Newbery, 1990:25; Santos *et al.*, 2010:5). Progressive increases in the roughness of road surfaces also impose increasing operating costs on subsequent vehicles (Newbery, 1988:295). The costs most adversely impacted by increases in road roughness are fuel consumption, vehicle maintenance and repairs, and tyre wear (CSIR, 2013:52).

Despite South Africa having the 10th largest road network- and 18th largest paved road network in the world (Kannemeyer, 2014:4), the country finds itself ranked 85th in the world in terms of vehicles per capita. Owing to this apparent mismatch between supply (in terms of road network size) and demand

[8] TDM refers to a set of interventions that aim to alter the behaviour of travellers by either reducing- or redistributing travel demand in a bid to improve the efficiency of the broader urban transport system (Broaddus, Litman & Menon, 2009:8).

(in terms of vehicle numbers), the funding required to upgrade, maintain and expand the country's roads is inherently large when viewed on a per-user basis (Van Rensburg & Krygsman, 2019). In 2014 alone, roughly ZAR 120 billion was spent on the country's road network, with approximately 41 percent of this attributable to infrastructure- maintenance, upgrades and expansions, and the remaining 59 percent categorised as operational expenditures (Van Rensburg & Krygsman, 2019).

The combination of rising GDP, which triggered demand for freight transport, and the deregulation of road transport, which resulted in considerable volumes of freight shifting from rail to road transport, have had a concerning stimulatory effect on the number of VKT driven by a growing cohort of heavy vehicles on South Africa's roads (DoT, 2018a:9). Consequently, road deterioration has been accelerated. The DoT (2018b:66) has acknowledged a general decline in the condition of South Africa's road network—attributing this decline to insufficient funding and a lack of support for alternative revenue sources. In 2014, it was reported that a road infrastructure maintenance backlog to the tune of ZAR 197 billion existed in the country (Kannemeyer, 2014:21), with this deficit expected to swell rapidly if alternative funding mechanisms that corroborate the user-pays principle[9] are not incorporated into existing means of funding (DoT, 2018b:66).

2.1.6 Oil Dependence

This externality refers not to the environmental impacts associated with oil use, but rather to the threat posed to a nation's economy and security as a result of reliance upon oil, particularly in the case of imported oil (Parry *et al.*, 2007:377; Santos *et al.*, 2010:7). Because crude oil and its by-products are inputs to most economic activities—either directly or indirectly—economic indicators such as GDP, unemployment levels and inflation rates are firmly hitched to the commodity's characteristically volatile price (Cleveland & Kaufmann, 2003:488). As a result, nations that quench their demand for oil with imports are particularly vulnerable to price- and exchange rate fluctuations, as well as potential political instability in oil-exporting nations.

In an attempt to protect consumers from international oil price volatility and exchange rate fluctuations, the *Equalisation Fund Levy* was introduced in 1979. Under the Central Energy Fund Act (No. 38 of 1977), retail fuel prices would include a per-litre contribution to the Equalisation Fund, which had the purpose of smoothing out monthly fuel prices, particularly during times of price shocks. Although written into legislature, this levy remained set at ZAR 0.00 per litre on both petrol and diesel from 1996 until it was ultimately scrapped in the 2000s. The self-adjusting *Slate Levy*, introduced in 2009, is a per-

[9] Because the damaging power of a particular vehicle is commonly assumed to be proportional to the fourth power of its axle load, the road damage caused by most passenger vehicles is practically negligible, while heavy vehicles cause virtually all road damage (Newbery, 1989:166). As such, charging mechanisms that reflect the user-pays principle are particularly important in the context of road user charges.

litre tax levied on the sale of fuel which is earmarked to repay negative balances in the slate account. This allows the Basic Fuel Price component reflected in retail fuel prices to be set on a monthly basis, despite the actual Basic Fuel Price fluctuating daily. While this mechanism prevents daily fluctuations in the retail prices of fuel, it provides no protection against price hikes over the longer term, as it simply delays the repayment of a cumulative under-recovery accrued during a particular month.

Oil reserves in South Africa are notably limited, fuelling a strong reliance upon crude imports and dependence upon the political stability of members of the Organization of Petroleum Exporting Countries (OPEC) (Department of Energy, 2017:5). Roughly 83 percent of the crude oil used in the country originates abroad, with more than 90 percent of this imported from Saudi Arabia, Angola and Nigeria (Department of Energy, 2018:13). In Figure 2.4, which provides a breakdown of South Africa's relative energy consumption for each fuel type over time, it can be seen that oil trailed only behind coal, albeit by a large margin, as the country's main energy source. While the nation's oil consumption did increase by more than 50 percent over the period shown in the figure, oil's share of the total energy consumption mix did not vary extensively. Of the country's total energy consumption, approximately 27 percent can be attributed to the transportation sector, with the lion's share of this utilised by the road transport sub-sector (Department of Energy, 2018:35). Because of the sector's reliance upon petrol and diesel (International Energy Agency, 2020a), road transport represents a significant stumbling block for the country to overcome if it is to shake off its dependence on oil imports.

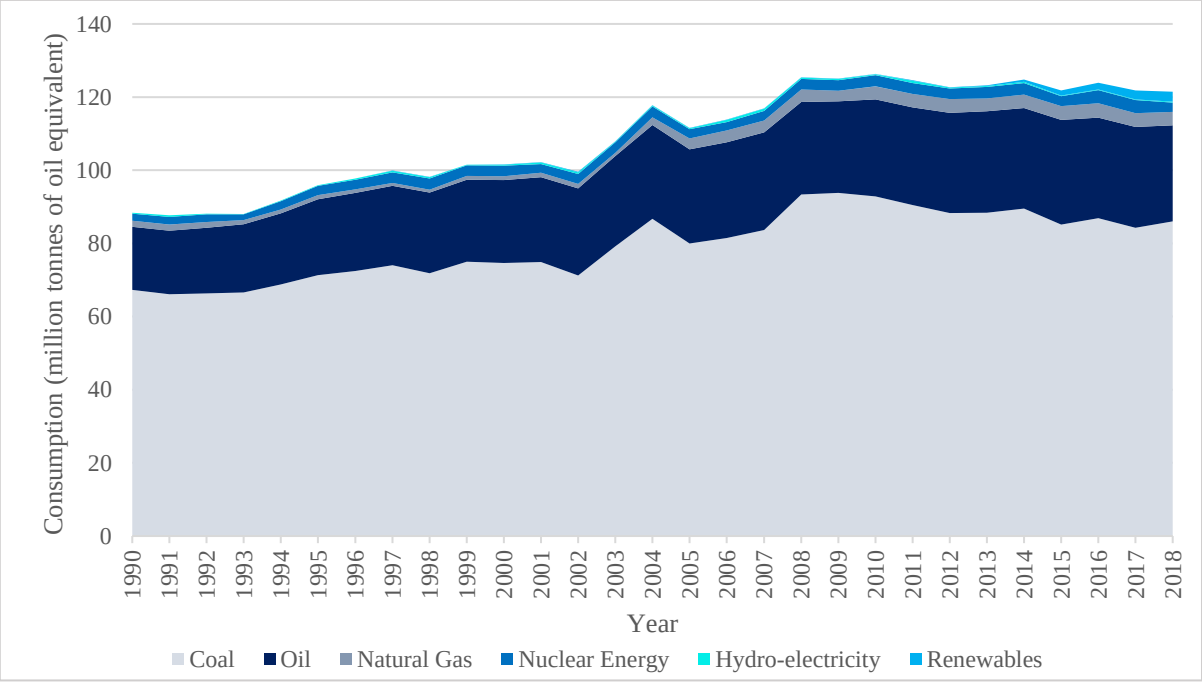

Figure 2.4: South Africa's primary energy consumption by fuel type (million tonnes of oil equivalent) (1990-2018).

(Source: British Petroleum, 2019)

Global demand for diesel and petrol is expected to grow at a decreasing rate between 2019 and 2025, largely owing to policy changes that encourage improved vehicle efficiency and reduced emissions, as well as a growing acceptance of electric vehicles (International Energy Agency, 2020a). Despite this, the long economic lifespan- and capital-intensive nature of oil-consuming equipment are expected to preserve oil's position as the dominant energy source in the transport sector until at least 2030 (Finley, 2012:36). While reductions in VKT among users of internal combustion engine (ICE) vehicles would contribute towards dampening the demand for oil-based products, a widespread transition to alternative means of vehicle propulsion (such as battery- or fuel cell electric vehicles) could set South Africa on the preferred trajectory towards energy independence over the long-term (DoT, 2018a:43). Aptly suggested by Cleveland & Kaufmann (2003:488), focussing on the vulnerability caused by reliance on *imported* oil overlooks the root of the problem—that of reliance on oil altogether, regardless of its origin.

2.2 Usage-Based Insurance

This section of the document recentres the discussion to the vehicle insurance context by revisiting the topic of UBI. This begins with a brief run-through of some of the pricing approaches already used by insurers to incorporate vehicle usage data into premiums. This includes an overview of behaviour-based UBI, which takes usage monitoring a step further by incorporating both the extent- and manner of driving into premiums. Thereafter, the main advantages associated with this new generation of behaviour-based UBI policies are outlined from the perspective of insurers, policyholders and broader society. While the benefits of UBI make for intuitive appeal, these policies are not without concerns. As such, the section concludes with an overview of some of the most common concerns held by the same stakeholder groups.

2.2.1 Proposed Pricing Approaches: A Multitude of Options

The failure of conventional insurance policies to reflect the marginal cost of risk associated with each kilometre travelled was first recognised as an inherent shortcoming close to a century ago. In 1925, when private vehicle use was fast-accelerating in the United States, it was suggested that drivers should pay for their insurance via a universal surcharge on the fuel price (Bordoff & Noel, 2008:43)—much like the method currently employed by South Africa's RAF to generate income. While this PATP insurance approach is not without inherent flaws—a theme discussed at length in Section 6.2—it could be viewed as a forebear of the UBI policies that are becoming increasingly popular today.

More recently, Litman (2011:5) outlined three broad categories of pricing methods for UBI—each discussed briefly below.

2.2.1.1 VKT Rate Factor: A Limited Attempt

Some insurers include rudimentary UBI principles by considering policyholders' VKT—usually obtained by means of self-reporting or odometer readings—as a rating factor. Because this approach typically involves premiums being set for a fixed term, insurers generally rely on VKT expectations

based on drivers' own estimates or odometer readings taken during previous terms. This limits the role that VKT can play in pricing premiums—particularly when policyholders first subscribe—as verified VKT data is yet to be recorded. Because this approach does not necessitate the use of telematics, concerns relating to implementation- and running costs, as well as driver privacy, can be abated.

2.2.1.2 Per-Kilometre Premiums: A Middle Ground

This approach involves vehicle insurance being sold on a per-kilometre basis as opposed to a monthly basis. Typically, policyholders pay in advance for their anticipated VKT—much like a tenant purchasing prepaid electricity or a cell phone user purchasing airtime. At the end of a specified period, policyholders can either receive rebates for unused kilometres or be billed for additional kilometres. Traditional rate factors are usually incorporated into this approach, resulting in lower per-kilometre premiums for relatively low-risk drivers.

An insurer that uses the per-kilometre premium approach typically splits its premiums into fixed- and variable components, with the variable component coming in the form of either a rebate or surcharge based on the revealed VKT of policyholders. If the rebate approach is used, policyholders pay upfront for both the fixed- and variable components and have the opportunity to earn rebates of varying sizes if their VKT remains below specified thresholds. Alternatively, if the surcharge approach is used, policyholders pay only the fixed component upfront and face subsequent surcharges of varying size if their VKT exceeds specified thresholds[10].

Like the VKT rate factor approach, the per-kilometre premiums approach can be implemented without the need for telematics—perhaps making it an ideal middle ground for both insurers and clients that are unwilling to commit to a fully-fledged behaviour-based UBI policy.

2.2.1.3 Telematics-Based Pricing: Shifting Focus to Behaviour

With progressive improvements in the accuracy, reliability and affordability of advanced telematics devices, it has become increasingly possible to include consideration for a multitude of aspects of policyholders' revealed driving behaviour, such as travel time, location, speed, acceleration, braking and cornering, in underwriting and pricing calculations. This allows insurers to include consideration for *how* policyholders drive in addition to *how much* they drive. The ever-widening proliferation of GPS-enabled smartphones presents additional opportunities for accurate- and affordable driver monitoring by means of mobile applications—an approach that altogether avoids the costs associated with installing approved telematics devices in policyholders' vehicles.

Progressive, a leading vehicle insurer in the United States, launched its *Snapshot* policy in 2008[11]. Before this, the company bemoaned the unverifiable nature of data acquired from self-reporting and the

[10] Timing issues relating to rebates and surcharges are re-visited in Section 5.1.

[11] At the time, this product was known as MyRate.

lack of useful information in public records for predicting future claim probabilities (Henderson, McMillan, Craig, Heinen, Olexa, McElroy & Lee, 2005). Policyholders who voluntarily participate in the Snapshot programme have various aspects of their driving behaviour monitored using either dedicated plug-in GPS devices or a smartphone application over a period of approximately six months. Upon completion of this initial monitoring period, low-risk Snapshot participants are rewarded with renewal discounts (Progressive, n.d.). Aspects of driving behaviour that are monitored in addition to VKT include braking, acceleration, time of travel and cell phone usage while driving (if a participant uses the smartphone application for behaviour monitoring). In the seventh year since the inception of Progressive's Snapshot programme, the company became the first UBI provider to collect more than ten billion miles of cumulative driving data (Progressive, 2014). Progressive has since expanded its UBI offerings beyond the personal lines segment by launching commercial policies suited for small businesses and truckers (Progressive, 2020a).

While behaviour monitoring is often lauded as a means to bring about reduced premiums for low-risk drivers that would otherwise be viewed as risky (such as relatively safe young drivers), the perceived intrusiveness of telematics may be overly off-putting to some. As such, many existing behaviour-based UBI policies are offered as opt-in services in tandem with traditional comprehensive insurance packages. Despite some concerns, which are discussed at length in Section 2.2.3, it is believed that telematics will play an increasingly prominent role in estimating- and pricing driving risk (KPMG, 2019:13) and it has been predicted that the number of active telematics-based insurance policies in Europe and North America will reach 47.9 million and 49.8 million respectively by 2023 (Berg Insight AB, 2019).

2.2.2 A Host of Benefits

An array of benefits could accrue to policyholders, insurers and broader society if the adoption of UBI policies were to become widespread. In this section of the thesis, some of the main benefits that UBI policies may afford to these stakeholder groups are explored.

2.2.2.1 Benefits for Insurers

Despite the well-established role of VKT as a significant predictor of accident risk (Bailey & Simon, 1960:7; Litman, 2005:39), challenges in obtaining accurate data through self-reporting have historically impaired the role that this factor could play in rate-making. Similarly, while there was never any doubt that some drivers are safer than others despite being viewed as equally risky by traditional rate factors, insurers lacked a practicable means to objectively collect data to represent the driving behaviour of their policyholders. Recent increases in the accuracy-, prevalence- and affordability of technologies that can be used to collect driving data have, however, kindled new opportunities for incorporating multiple aspects of behaviour into underwriting and pricing. The purpose of this data collection and subsequent analysis is to uncover aspects of behaviour that better reflect risk than what traditional rate factors would

on their own—ultimately resulting in improved actuarial accuracy (Ayuso, Guillen & Nielsen, 2017:17; Friedman & Canaan, 2014:2; Karapiperis, Birnbaum, Brandenburg, Castagna, Greenberg, Harbage & Obersteadt, 2015:38). Because of this improved actuarial accuracy, UBI providers can set premiums based on more accurate risk profiles. As such, UBI may provide insurers with a means to curtail the threat of adverse selection[12].

Pricing coverage on the basis of accurate risk profiles may also allow insurers to gain a competitive advantage among low-risk clients by offering lower premiums (Paefgen, Staake & Thiesse, 2013:193). This is likely to be a particularly attractive proposition among relatively low-risk drivers who would otherwise face high premiums based on traditional rate factors, such as age. By acquiring a customer base of low-risk clients, providers of UBI are also likely to face both fewer claims and claims of lesser value—a coveted result for insurers, particularly if these clients are coaxed away from their traditional competition. Relatedly, by offering an ongoing incentive to reduce one's exposure to risk, the tariff structure of UBI policies provides a mechanism with which insurers can combat moral hazard among its policyholders.

By entering the domestic UBI market in its infancy, insurers would afford themselves a head start in which they could begin collecting and deciphering the volume of data required to underpin reliable predictive models (Friedman & Canaan, 2014:10). Conversely, insurers that remain idle may eventually find themselves playing catch-up after having already lost their relatively low-risk clients to insurers that were willing to offer cheaper premiums in exchange for behaviour monitoring during the initial phases of their policies.

While the initial lure of lower premiums may be enticing enough for some motorists, Friedman & Canaan (2014:11) and Deloitte (2016:29) suggest that the long-term strategy of UBI providers should be to offer a complementary suite of value-added services and features as part of their policies. Intuitive examples include vehicle recovery, roadside assistance, route suggestions, driver feedback and some form of loyalty programme with partner companies. By offering features and services that extend beyond simple coverage, insurers create more opportunities for client engagement and relationship building—which may ultimately reduce the likelihood of churn among policyholders.

It has also been proposed that UBI could offer insurers opportunities to derive benefits relating to claims handling. For example, the collection- and analysis of driving data could allow insurers to objectively unpack certain vehicle dynamics in the event of an accident and, in doing so, safeguard themselves against fraudulent claims (Dang, 2017:20).

[12] In the context of vehicle insurance, adverse selection arises when a lack of information prevents insurers from discerning between the risk levels of individual policyholders and, as a consequence, the insurer lacks a means to reflect high risk in heightened premiums.

2.2.2.2 Benefits for Policyholders

UBI is often credited with being a more transparent alternative to traditional vehicle insurance policies as policyholders are charged according to their observed behaviour, as opposed to the collective behaviour of a group (Adkins, 2004:24). In the case of conventional vehicle insurance schemes, policyholders are typically placed into tariff classes based on a variety of driver- and vehicle-related rate factors. Driver-related factors might include variables such as age, crash record and gender, while vehicle characteristics such as the age, marque and model constitute vehicle-related factors, for example (Paefgen *et al.*, 2013:193).

In addition to improved transparency, UBI policies are typically praised on the grounds of fairness. Traditionally, low-risk drivers' premiums have, in effect, been used to cross-subsidise those of higher-risk drivers in order to offer competitively-priced policies to the latter group (Litman, 2018:26). It could hence be argued that conventional insurance policies overcharge their low-risk drivers, despite them being less likely to file claims, ceteris paribus. The improved transparency and fairness of UBI policies often culminate in savings for low-risk policyholders.

It has been proposed that merely monitoring individuals' driving behaviour may have a positive effect on their driving safety as they show heightened caution simply because they are aware of being monitored (Friedman & Canaan, 2014:18)—a phenomenon known as the Hawthorne effect. As discussed in Section 2.2.2.1, the incentive structures of behaviour-based UBI policies also typically present ongoing invitations to policyholders to reduce their exposure to risk. Because higher-risk UBI policyholders would be subjected to the highest premiums, these drivers would be incentivised most to reduce their VKT and improve the safety of their driving[13] (Victoria Transport Policy Institute, 2019). The outcome of these effects is curtailed accident likelihood among policyholders.

Because a positive link exists between average annual VKT and income, premiums that are linked to distance can be seen as progressive (Litman, 2018:2), allowing individuals of lower socioeconomic status to benefit from cost savings. Similarly, when subscribed to a UBI policy, motorists could potentially limit their VKT to ensure that their premiums remain within their available budget while still being covered. Conversely, because of their inflexible tariff structures, conventional policies may force individuals of lower socioeconomic status to drive without coverage.

[13] While this may be a conceptually valid argument, encouraging voluntary buy-in and retention among high-risk clients may prove challenging, as their premiums would likely be higher under a UBI policy than an equivalent traditional policy. As such, the insurer may need to turn to value-added services and features, as mentioned in Section 2.2.2.1, to offer an enticing value proposition to policyholders that are unlikely to achieve premium savings. The topic of achieving positive client evaluations amid rising prices is discussed at length in Section 5.10 of the document.

2.2.2.3 Benefits for Broader Society

Owing to the potential premium savings afforded by UBI providers, these policies may have the potential to curtail the proportion of uninsured vehicles (Adkins, 2004:8). In the South African context, it was estimated that up to 70 percent of the country's 11 million-strong (registered) vehicle fleet was uninsured in mid-2018 (AA, 2018)—a worryingly large share in a country plagued by road traffic accidents and fatalities. Increasing the proportion of insured vehicles may bring about widespread reductions in average premiums, as the cost of providing coverage would be spread across a larger cohort of drivers. Furthermore, more widespread penetration of both third-party damage- and comprehensive coverage may reduce the number of hazardously damaged vehicles on South Africa's roads.

Because of the incentive to reduce one's exposure to driving risk, it could be argued that the widespread adoption of UBI policies may lead to improved road safety outcomes on a broader scale. As a result, the plight of road accidents and their associated costs—discussed in Section 2.1.2—may be reduced. Additionally, a nation of safer drivers would significantly decrease the pressure on the under-strain RAF to fulfil its already-challenging mandate[14].

As alluded to in Section 2.1, it is commonly asserted that the potential of UBI policies to abate externalities extends beyond accident costs. When viewed as a method of TDM, it has also been suggested that UBI may face less public resistance than policy measures such as fuel taxes (Santos *et al.*, 2010:26) as no transfer payments are made between drivers and the state and, as such, no additional cost categories are incurred by insured drivers. Moreover, the distance-related externalities that UBI policies might erode are substantially more prominent than those linked to fuel (such as oil dependency and GHG emissions) (Parry, 2005:288). Owing to the volatility of the basic fuel price, changes in the retail price of fuel may be viewed as temporary, potentially limiting a fuel tax's potential to impact driving behaviour in the long run. In contrast, UBI schemes would provide a more permanent incentive for policyholders to alter firmly-entrenched behaviour patterns (Bordoff & Noel, 2008:46).

As discussed in Section 2.1.2, it is not uncommon for governments to levy taxes on insurance premiums as both a price signal and as a means to raise revenue. Because modern UBI policies allow premiums to be differentiated granularly to accurately reflect the risks of policyholders, it could be argued that any flat-rate taxes levied on these premiums are also automatically reflective of risk. As such, both the premiums themselves and the taxation thereof may corroborate the user-pays principle in an improved manner.

[14] This advantage relates specifically to UBI in the context of the current insurance arrangement, which confines this type of policy to property coverage only.

2.2.3 Concerns and Challenges: Smooth Sailing or Rocking the Boat?

Although the potential benefits of UBI are both apparent and abundant, the required alterations to the traditional insurance business model may be a source of unease among insurers. Furthermore, concerns among potential policyholders and broader society may hinder the rate at which these policies are accepted by the local market. In this section of the thesis, some of the most common concerns and challenges posed by UBI policies are presented from the perspective of each of these stakeholder groups. In select examples, remedies to (partially) address these concerns are also provided.

2.2.3.1 Concerns Among Insurers

A consideration with considerable impacts on the cost-, practicability- and likelihood of consumer acceptance of UBI policies is the means used by the insurer to collect driving data. Despite odometer readings representing a relatively cost-effective method of tracking VKT, several issues are rooted in its rudimentary nature. For example, rolling back mechanical odometers is possible[15] (Bordoff & Noel, 2008; Santos *et al.*, 2010:26) and underreporting on self-completion forms remains a challenge. Odometer readings could be verified by authorised third parties, such as maintenance- and service centres, however, this approach would be administratively burdensome for insurers and time-consuming for policyholders, especially if regular readings are required. Furthermore, insurers that rely only on odometer readings surrender the opportunity to integrate other aspects of risky driving behaviour, such as aggressive driving styles and night-time travel, into their underwriting and pricing. These VKT-only UBI policies may unwittingly stimulate demand among accident-prone motorists with above-average per-kilometre claim costs (Litman, 2018:29), particularly if they are low-VKT drivers who stand to benefit from premium savings. Telematics-based policies that include the monitoring of multiple aspects of driver behaviour are unlikely to face this issue, as risky drivers would fail to benefit significantly from rewards, regardless of how modest their driving distance is. While using telematics devices to track vehicles may provide a more convenient, reliable and comprehensive means to collect driving data, cost-, privacy- and security concerns represent common sources of critique against the use of these technologies.

The costs incurred by insurers for monitoring driving behaviour may impede their willingness to roll out telematics-based UBI policies (Edlin, 2002:36; Santos *et al.*, 2010:26). These policies typically involve significant device- and installation costs, as well as subsequent monitoring- and administrative costs. To limit the costs associated with driver monitoring, some insurers have turned to GPS-enabled smartphone applications instead of dedicated plug-in devices. In addition, some vehicle marques have equipped their newer models with devices that can record driving data and transmit it directly to insurers.

Acquiring enough driving data to underpin acceptably reliable predictive models may, too, prove to be a costly exercise. To entice consumer buy-in and, in doing so, obtain a large enough customer base to

[15] This issue has, however, been largely overcome by the electronic odometers present in most modern vehicles.

supply the data on which to base their predictive models, an insurer may need to offer participation discounts and remove the threat of higher premiums for risky drivers during the early stages of their UBI launch. Total revenues derived from premiums may decrease as a result and, even if these decreases were offset by lower claim pay-outs, the amount available for investment by the insurer would decrease, potentially resulting in reduced profit for insurers (Litman, 2018:29). While this would not necessarily be a permanent arrangement, it does pose a clear opportunity cost to insurers. Friedman & Canaan (2014:14) suggest that a collaborative model involving either other insurers or third-party companies could provide a relatively inexpensive method to fast track this initial period of data collection—perhaps a particularly alluring proposition among insurers with relatively small client bases.

2.2.3.2 Concerns Among Potential Policyholders

While the advancement of telematics devices has kindled new opportunities for reliable driver monitoring, concerns relating to the privacy and security of policyholders are often at the fore of arguments against telematics-based UBI policies. Concerns may stem from scepticism relating to insurers' intentions as well as the potential implications of data breaches (Friedman & Canaan, 2014:12). The thought of having one's driving behaviour monitored and scrutinised may ignite fears of an Orwellian future in which one's driving data is used for unscrupulous purposes beyond the scope of insurance. Despite the imaginative concerns of some cynics, a survey conducted by Progressive found that more than half of respondents would allow the company to monitor their driving behaviour in return for reduced premiums, with particularly favourable responses obtained from lower-VKT drivers (Bordoff & Noel, 2008:45).

Because of UBI policies' focus on driving behaviour, which is inherently open to variation over time, these policies may cause seemingly unpredictable premiums for policyholders (Litman, 2011:4). Similarly, it has been suggested that individuals tend to overestimate their usage of a particular product or service, often to the extent that usage-linked options appear more expensive than their flat-rate alternatives (Lambrecht & Skiera, 2006:214). By coupling premiums to usage, it may be that the link between payments and vehicle use becomes unsettlingly apparent to policyholders. While this effect may encourage curtailed driving, it may also be overly off-putting for potential policyholders. It is also possible that the unpredictability of these schemes could make obtaining quotations challenging, thereby hindering comparisons between policies and complicating the purchase decision. The combined effect of the factors mentioned in this paragraph—known as the *flat-rate bias*—is a general tendency to prefer flat-rate tariffs over those that are usage-linked, often even in cases where the latter would be more affordable. This bias, which represents a concern for both potential clients and insurers, is discussed at length in Section 5.4.

Some drivers could face higher premiums when subscribed to a UBI policy than when subscribed to an otherwise equivalent traditional policy. While the UBI premiums may better reflect their risk exposure,

the elevated costs could come as a surprise to drivers, particularly if they considered themselves to be relatively safe drivers. One might speculate that this unwanted surprise could ultimately increase the likelihood of churn among policyholders. The effect of overconfidence in one's driving ability is re-visited in Section 5.6.

2.2.3.3 Concerns Among Broader Society

Assuming that less-risky drivers shift progressively to UBI policies, non-shifters who favour traditional insurers may face higher premiums as their respective insurers' customer bases become increasingly risky, on average. While it might be argued that this rise in premiums is simply a case of higher-risk policyholders facing the proverbial music in response to their own undesirable driving habits, relatively low-risk non-switchers may yet face heightened premiums that effectively cross-subsidise their higher-risk counterparts. It has been suggested that this could fuel consumer backlash and unwanted attention from regulatory authorities, as lower-risk drivers appear to be penalised for simply not switching to a UBI policy (Friedman & Canaan, 2014:17).

While UBI policies are often praised as a means to deliver multiple societal benefits, such as improved road safety outcomes and mitigated environmental desecration, the direct benefits that accrue to the insurer would be only a fraction of the total societal benefits. This suggests that insurers' willingness to adopt these policies may be more subdued than what the societally efficient outcome would dictate. As a result, some form of government intervention—perhaps in the form of subsidisation—may be required to persuade insurers to invest in UBI policies.

2.3 Vehicle Property Insurance in the Context of South Africa

In this section of the literature review, focus is directed to the South African context. To this end, an overview of the local market for discretionary vehicle property insurance as well as a rundown of some of the efforts made by insurers to introduce UBI products to the South African market are provided. It is worth noting that this section of the thesis focusses only on South Africa's market for discretionary vehicle property insurance and that the nation's compulsory personal injury insurance arrangement is discussed at length in Chapter 6.

2.3.1 Overview of the Local Market for Vehicle Property Insurance

Despite underwhelming economic growth forecasts, gloom-ridden consumer- and business confidence, social instability and unavoidable pressure posed by the Coronavirus Disease 2019 (COVID-19) Pandemic, South Africa's relatively mature insurance sector has remained resilient of recent (Deloitte, 2021; SAIA, 2021). The country finds itself firmly at the forefront of Africa's insurance market in terms of premiums written. While Africa contributed less than 1.2 percent to global premiums written in 2016, almost three-quarters of this originated in South Africa, making the country's insurance market the 19th largest in the world (PwC, 2018:13).

In 2018, the South African short-term insurance[16] industry achieved gross written premiums (GWP) in excess of ZAR 106 billion, representing year-on-year growth of 8.14 percent. Vehicle insurance constituted roughly 45 percent of the South African non-life insurance industry's overall business (SAIA, 2019:8). A snapshot of the relative market shares—measured in terms of GWP in 2017—of the major role-players in South Africa's vehicle insurance industry is presented in Figure 2.5.

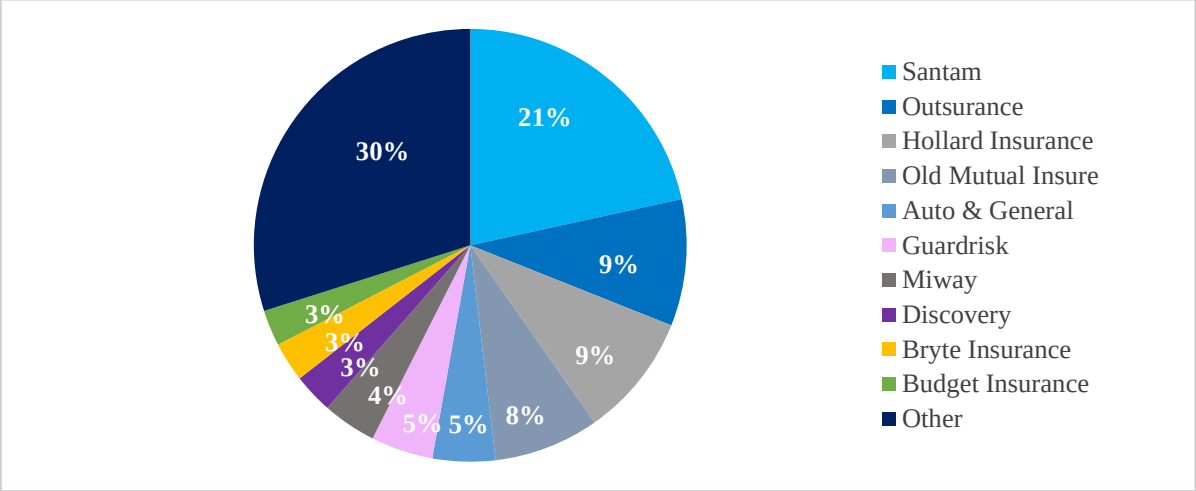

Figure 2.5: South African vehicle insurance market shares (by Gross Written Premiums) (2017). (Source: Prudential Authority, 2018:9)

As mentioned in Section 2.1.2, insurance beyond the scope of the RAF is not compulsory in South Africa. In other words, no form of vehicle property insurance is mandated in the country. Partly as a result of the discretionary nature of property insurance, the majority of South Africa's vehicle parc remains uninsured (AA, 2018). Growing car ownership levels have combined with this large cohort of yet-to-be-insured vehicles to create a conducive environment for continued market penetration.

2.3.2 Usage-Based Insurance in South Africa

Although the adoption of behaviour-based UBI has been noteworthy in parts of the developed world, market penetration in the South African context remains limited. While the domestic market has demonstrated a willingness to adopt telemetry devices aimed at countering vehicle theft (Moodley, 2019:4), attempts by insurers to integrate driving behaviour data obtained from telematics devices into policy offerings have been limited among the country's incumbent short-term insurers. Although faced with the perpetual task of maintaining relevance with an ever-evolving client base in a highly competitive environment (KPMG, 2020:4), many of the nation's traditional insurers have been largely reluctant to alter their existing business models and legacy systems (Moodley, 2019:10). While some providers of traditional policies remain either languid toward- or firmly against the adoption of usage-

[16] Short-term insurance is insurance that protects policyholders against losses relating to their assets, while long-term insurance is taken out to cover life-altering events such as retirement, death and disability (Real People Assurance, 2018).

based principles, those that have spearheaded efforts to bring UBI to the local market arguably already hold an advantage over their competitors by having built a wealth of driving data that can be used to improve the actuarial accuracy of rate-making processes.

One of only a handful of companies offering usage-based policies in the South African market is Discovery Insure. Through its *Vitality Drive* programme, policyholders are rewarded in a variety of ways for displaying desirable driving behaviour. For example, subscribers can earn fuel rewards up to the value of ZAR 800 per month or earn up-front discounts of up to 20 percent on their premiums (Discovery, n.d.). Vitality Drive is an optional programme for existing Discovery Insure comprehensive vehicle insurance policyholders and has an additional monthly fee attached for participation.

Discovery is a firm believer in its shared value model and has deployed this approach across various industries. Figure 2.6 outlines the company's views towards the potential benefits of this model in the vehicle insurance context. The company's policyholders have displayed substantially safer driving behaviour than the average South African driver, which has resulted in policyholders being involved in 60 percent fewer road fatalities than the country's average. Moreover, these policyholders have, on average, displayed a 17 percent improvement in their driver performance score[17] within the first month of participation (Discovery, 2018:88), showcasing that driving behaviour can be altered through effective incentivisation over a relatively short period.

Figure 2.6: Benefits associated with Discovery's shared value model in the context of vehicle insurance.

(Source: Discovery, 2019:77)

[17] Policyholders improve this score by exhibiting desirable driving behaviour and completing various courses and assessments aimed at promoting driver- and vehicle safety.

Discovery Insure and its Vitality Drive programme—launched in 2011—remain young among a collection of well-established short-term insurance incumbents and, as such, hold a relatively small share of the market. Despite this, the company's growth outstripped that of all its competitors in the local short-term personal lines insurance market in 2014 (Discovery, n.d.), perhaps demonstrating the country's appetite for more-tailored policies. In the 2018 financial year, the Discovery Insure client base reached 200 thousand, representing year-on-year growth of 18 percent (Discovery, 2018:87). Furthermore, it was estimated that up to twelve percent of all new vehicle insurance business was secured by Discovery Insure in 2016 (Accenture, 2016:11), implying that the company continued to punch above its proverbial weight by eroding the market shares of its heavyweight counterparts.

Through its *Monthly Payback* scheme, *Dialdirect*, a South African short-term insurer that forms part of Telesure Investment Holdings' portfolio, offers its comprehensive vehicle insurance clients up to 25 percent of their premiums back for displaying desirable driving habits. For an additional monthly fee, the company's comprehensive vehicle insurance policyholders qualify for the *Payback Booster* option, which allows participants to inflate their cashback rewards to 75 percent of their premiums. The insurer's mobile application uses location services to track and assess the behaviour of drivers according to several traits, including acceleration, braking, speeding, mobile phone use while driving, a stop-start index[18], night-time driving and VKT. This process allows a monthly *Overall Drive Score* to be established, which serves as the primary influence on the size of the rewards earned by policyholders (Dialdirect, n.d.).

Dialdirect's innovation in the personal lines segment has not gone unrecognised. In March 2019, the company received the Product of the Year award in the Services category of the annual Product of the Year South Africa awards (Autotech News South Africa, 2019), perhaps indicating a willingness among the local market to buy into telematics-based insurance products and become actively involved in risk-mitigation.

King Price Insurance, a local short-term insurer known for its off-beat tariff structure in which policyholders' premiums decline each month in parallel with the depreciation of their insured assets, added a UBI policy to its range of personal lines offerings in mid-2020. While the first-movers in South Africa's UBI segment consider multiple aspects of driving behaviour in their setting of premiums, King Price's *Chilli* policy represents a bare-bones alternative in which only VKT is added to traditional rate factors. With this policy, clients have the option to either use a smartphone application to submit monthly odometer readings or to sidestep this task by paying an additional fee for an approved tracking system. While the success of this policy remains to be seen, it could be argued that the company's simplistic

[18] This value increases at intersections and in busy traffic.

UBI policy represents an enticing proposition for low-mileage drivers who see the merit of linking premiums to usage but are concerned that their driving data could be used to their detriment.

2.4 Results of Related Market Assessments

This section of the document summarises the results of closely related research that has already been undertaken. It is worth noting that a thorough search for publicly available research on this topic in the South African context yielded limited results. As such, this section, for the most part, draws upon international perspectives.

Accenture (2016) explored the short-term insurance market of South Africa to assess the demand for digital insurance services, such as modern UBI. The study, which involved a survey of 1,500 participants, gauged policyholders' perceptions, preferences and behaviours relating to communication with insurers. The study also surveyed policyholders' responses to multiple value propositions and digital offerings, and featured both stated- and revealed preference questions. With 59 percent of respondents having not heard of telematics offerings, prior awareness thereof was modest. The survey observed that more than half of respondents had subscribed to their existing policy within the previous three years and that the potential to save on premiums was the most favoured benefit offered by integrating telematics in insurance policies. This is perhaps indicative of an industry in which customers are price-conscious and switching costs are low. In addition, a noteworthy negative difference was observed between policyholders' existing expectations of value for money and their perceptions relating to the delivery thereof. When policyholders were asked about their concerns relating to driver monitoring for insurance purposes, it emerged that efforts to build trust and improve transparency would be necessary. Among younger respondents (aged 18-34), a preference for digital communication channels was observed, while more-mature clients preferred traditional channels. In addition, younger policyholders showed greater interest in personalised offerings and were more willing to provide personal information in exchange for incentives and offers than their older counterparts. As a result, an opportunity appears to exist for personalised policies which leverage telematics data to deliver cost savings to low-risk drivers. The consultancy concluded that a total of ZAR 115.2 billion in GWP could potentially be added to the local short-term insurance industry if its participants were to digitise their legacy systems while actively addressing consumers' concerns.

To gauge interest in usage-linked leasing and insurance schemes among residents of the Twin Cities Area, Minnesota, market assessment- and stated-preference surveys were created and administered by Cambridge Systematics, Inc. on behalf of the Minnesota DoT (Buxbaum, 2006a). The market assessment survey was conducted telephonically and involved the participation of 401 randomly selected households in the region. A subsequent survey of 100 drivers with experience of vehicle leasing was conducted to supplement the results obtained from the initial survey. During these telephonic surveys, respondents were invited to participate in a more detailed follow-up stated preference survey,

which ultimately gathered responses from 183 participants. The surveys were comprised mainly of scaled-response- and single response questions. Approximately one-quarter of those that participated in the stated preference survey expressed interest in the concept of VKT-linked insurance, with the prospect of only paying for the distance driven being particularly attractive to respondents. Concerns surrounding privacy and the potential unpredictability of premiums appeared to be prominent among those who participated. Roughly eight percent of the surveyed individuals believed that UBI policies would incite them to greatly reduce their VKT. It was indicated that trips would be combined more regularly and that most VKT reductions would occur on weekends and during the night, when a larger share of trips are discretionary in nature. It was concluded that UBI products would appeal to a "small, but not insignificant" proportion of the wider population, and that insurers could capitalise on this by tailoring their products to meet the specific needs of this group.

In a study undertaken in Greece, Tselentis, Theofilatos, Yannis & Konstantinopoulos (2018) investigated factors that influence policyholders' willingness to pay for two distinct types of UBI policies; one in which premiums are based purely on VKT and another in which other elements of driving behaviour are included in premium-setting. This was achieved by conducting a survey of 100 participants which included both stated- and revealed preference questions. The survey contained questions relating to respondents' personal details (such as demographic information), general driving information (such as their driving experience, current insurance costs etc.), driver behaviour data and stated preference scenarios about alternative insurance policies. Most questions were answered using a five-point rating scale and the average completion time was 10-12 minutes. The survey was administered to obliging motorists who stopped at a service station in Greece's Attica region. The results suggested that women and smartphone owners were most likely to consider alternative insurance policies, while policies based on how policyholders drive were found to be particularly unattractive to individuals older than 40 years. In addition, it was found that stricter speed reduction requirements would result in a lower likelihood of respondents selecting UBI policies.

Rejikumar (2013) explored customer perceptions of UBI policies in the Indian context using a two-phased approach. The study aimed to investigate perceptions of the individual- and societal benefits associated with UBI policies, the ease with which UBI policies are understood and the intention of accepting UBI policies among customers. In the first phase of the study, interviews were conducted with a focus group to aid in creating a list of indicators that could be used as variables for the study. The subsequent phase included a structured questionnaire which was administered in-person to 248 respondents (of which 213 responses were deemed usable) from the state of Kerala. The questions included were closed-ended in nature and required participants to answer according to a five-point Likert scale. The study found that 40 percent of respondents showed preference towards usage monitoring by means of internet-enabled devices (such as GPS devices), while 44 percent preferred the more conventional approach of voluntary disclosure with subsequent cross-checking by insurance companies.

A statistically significant relationship was observed between respondents' preferred criteria for premium calculation and their approximate annual vehicle usage (i.e., those who recorded higher annual VKT were more likely to prefer past driving history over vehicle usage as a basis for premium-setting). Contrary to the results obtained by Buxbaum (2006a), the study suggested that the perceived privacy risks associated with UBI policies would not necessarily influence the intentions of clients to accept these policies.

Using data obtained from a survey undertaken by Deloitte in 2014 in the United States, Friedman & Canaan (2014) explored existing motorists' views on UBI. The survey gathered responses from 2,193 financial services consumers and included questions that related to perceptions, expectations and mobile technology experience. The study's overarching hypothesis—which was ultimately supported by the survey results—posited that not all market segments would allow their driving behaviour to be monitored by means of a smartphone application for insurance purposes. The researchers identified three segments of motorists, each with different levels of receptivity towards behaviour monitoring by insurers in exchange for possible premium discounts. The survey results suggested that close to half of all motorists would be opposed to UBI. Among a variety of demographic factors, age was found to be the most prominent predictor of respondents' willingness to subscribe to UBI, with younger cohorts showing significantly greater receptivity. The authors also explored the magnitude of the discounts that motorists would demand in exchange for allowing behaviour monitoring. While this question yielded a considerable degree of variation in opinions, approximately half of the respondents indicated that discounts of between 11- and 20 percent would be required. In addition to these survey insights, the authors unpacked certain challenges that they believed UBI providers would face and provided potential remedies for these obstacles.

2.5 The Youthful Market Segment: A Burgeoning Segment with Disparate Demands

As mentioned in the introduction, the youthful market segment has contributed disproportionately to the uptake of UBI policies in some nations with mature offerings (Insurance Europe, 2019:22). This section of the literature review begins by outlining the definition adopted for the purposes of this study to describe the youthful segment. In addition, this section serves to reiterate the significance of the youthful segment as well as to consider the potential underpinnings of UBI policies' popularity among this cohort.

Because adjectives relating to age like "youthful" and "young" are open to some degree of subjectivity, it is beneficial to clarify the study's intended use of these terms. In the study, the terms "youthful", "younger", "digital natives" and any other derivatives thereof were used interchangeably. The term "digital native" has come to prominence since its initial conceptualisation in 2001 and describes the generation that was brought up during the digital age (Prensky, 2001). Because no universally accepted chronological starting point exists to define this digitally-empowered cohort, the inclusion criteria of other locally-conducted studies informed that of this study. Tustin, Goetz & Heydenrych Basson (2012)

considered those born during- or after the "late 1980s" as part of this group, while Brown & Czerniewicz (2010) included those born after 1982. In a more recent report, PwC (2018) considered those born after 1990 to constitute this group. This study adopted a middle ground by considering 34 years of age as an upper bound for inclusion in this cohort. Because the digital era is ongoing, the term "digital native" also does not typically have a defined lower bound on age as of yet. As such, this study generally made use of this term to refer to individuals who were of legal driving age[19] and, accordingly, formed part of the current market for vehicle insurance. As such, motorists between the ages of 18 and 34 were prioritised in the study.

South Africa's population is characterised by a large- and growing youthful cohort. Between 2002 and 2020 the population cohort under the age of 35 grew by 20 percent to reach 38.7 million (Statistics South Africa, 2020). Since the cohort below the inclusion age of the study is also large and expanding, it is expected that the growth within the target market for vehicle insurance will be sustained over the long-term. It is expected that these population- and generational shifts will initiate a large- and sustained wave of new insurance clients with different demands to their precursors (PwC, 2018:51).

Modern UBI offerings typically require that consumers have a certain degree of digital competence to utilise the full set of features- and derive the maximum benefits from these policies. Because the relatively young segment of the population was born during the digital age and, accordingly, has typically had exposure to digital technologies throughout their lives, it has been posited that these individuals, on average, possess a greater ability to intuitively utilise digital technologies than their more-mature counterparts. While the terms *digital native* and *digital immigrant* were first coined by Prensky (2001) to describe differences between the educational needs of modern students and those born before the digital era, the terms have since been adopted across contexts to describe a potential generational gap in digital competence between these groups. It may be that the digital adeptness typically possessed by this population cohort contributes towards younger insurance clients' preference for digital channels (Accenture, 2016:7; PwC, 2018:51) and a greater willingness to accept driving behaviour monitoring (Friedman & Canaan, 2014:6).

As discussed in Section 2.2, the collection and subsequent operationalisation of accurate driving data presents an opportunity for insurers to reflect the observed driving behaviour of policyholders in premiums—allowing risk to be better predicted than with traditional predictors alone (Ayuso *et al.*, 2017:17; Friedman & Canaan, 2014:2; Karapiperis *et al.*, 2015:38). This improved actuarial accuracy gives insurers the opportunity to deliver cost savings to relatively low-risk drivers. The potential for cost savings may be particularly accentuated among young drivers with modest vehicle use and safe driving habits, as traditional insurers would typically disregard these usage traits and fixate on their age. It is

[19] In this instance, the legal driving age refers to the minimum age at which an individual in South Africa is allowed to obtain a Code B (or superior) driving licence.

also worth considering that many of these drivers are likely to earn relatively modest incomes due to their age. As a result, both the nominal- and relative cost savings afforded by UBI may be particularly pronounced among young drivers. Friedman & Canaan (2014:6) observed that relatively young motorists were considerably more likely than their more-mature counterparts to allow an insurer to monitor their driving behaviour on the premise that they may benefit from premium discounts as a result. Notably, it was also found that the younger segment would be willing to accept smaller discounts in exchange for allowing this driving behaviour monitoring—partly a product of their relatively modest average incomes.

Upon entrance into the UBI market, insurers have usually relied on cost savings as an initial enticement for subscription (Friedman & Canaan, 2014:10). During the infancy of these policies, when significant data collection is required to underpin reliable predictive models, these discounts are not necessarily hinged upon policyholders' driving performance, but rather represent a form of remuneration in exchange for policyholders' driving data. Because of the potential for noteworthy nominal- and relative cost savings among relatively young motorists, an ideal opportunity exists for insurers to appeal to this burgeoning segment using cost savings. In other words, the growth within the cost-conscious- and digitally-empowered youthful segment appears to be well-timed to underpin insurers' new predictive models. As such, an opportunity appears to exist for mutually beneficial relationships between new UBI providers and the growing youthful segment.

In addition to the intuitive benefits of an expanding target market, the youthful nature of this segment may present an opportunity for UBI providers to benefit from a well-documented emotional bias known as the status quo bias. Individuals have been found to routinely display preference towards maintaining the status quo when making decisions among alternative options (Samuelson & Zeckhauser, 1988). One proposed explanation for this phenomenon is that the potential disadvantages of departing from the status quo loom more prominently than the potential benefits[20] (Kahneman, Knetsch & Thaler, 1991:197). It has also been argued that departing from the status quo often requires a degree of perceived mental exertion (Lambrecht & Skiera, 2006:214) and this, in combination with cognitive limitations[21], prompts individuals to view the status quo as a less-onerous and relatively risk-free option (behavioraleconomics.com, n.d.). The likely expansion within the youthful vehicle insurance market segment would imply that a considerable number of potential clients will be selecting an insurance policy for the first time within the coming years. Having not subscribed to a vehicle insurance policy before, it might be argued that these first-time consumers may avoid the potential inertia shown by existing traditional policyholders towards UBI as a result of the status quo bias.

[20] This concept—known as loss aversion—is discussed further in Chapter 5.

[21] Cognitive limitations and their influence on decision-making are explored at length Chapter 5.

With the youthful segment characterised by cost-consciousness and pragmatism relating to purchases, brand loyalty has dwindled among young customers and priority has shifted towards client-centric products (PwC, 2018:51). The collection- and utilisation of granular driving data by insurers to set tailored premiums complements young consumers' collective preference for personalised products and presents opportunities for cost savings among the price-conscious youthful segment (Accenture, 2016:12; Francis & Hoefel, 2018:8; PwC, 2018:51) An ever-increasing number of digital natives of legal driving age, combined with rising levels of car ownership (Mtembu, 2020), could mean that the youthful target market for vehicle insurance (and UBI specifically) is poised for sustained growth (PwC, 2018). An insurer's failure to meet the demands of this segment could not only limit the extent to which it can capitalise on this growth, but also leave the company trailing behind as its competitors utilise the segment to underpin their usage-based predictive models.

3 RESEARCH OVERVIEW

An outline of the research undertaken is provided in the Figure 3.1. Two broad overarching aims—indicated by bright blue shading on Figure 3.1—dictated the direction of the study. Accordingly, the study involved two avenues. The first—represented by the left half of Figure 3.1—took the perspective of private sector providers of vehicle property insurance and involved undertaking a market segment assessment survey that explored the perceptions of UBI policies held by young South African motorists. This research avenue focussed chiefly on the existing overarching insurance arrangement of South Africa, which limits UBI to property coverage. The survey contained questions from six broad categories, indicated by navy blue shading in Figure 3.1. Each of these categories is described at length in Chapter 4 of the thesis. The four green blocks in the research overview contain phrases that represent the research objectives that relate to the market segment assessment survey, which were expressed formally in the introductory chapter. The survey itself can be viewed in Appendix A.

The second research avenue—represented by the right half of Figure 3.1—considered the perspective of the state and employed an exploratory case study approach to consider the potential scope for- and merits of adopting an alternative mandatory road accident insurance arrangement in South Africa. This part of the thesis began with an overview of the RAF and took an in-depth look at the entity's fundamental challenges that relate directly to its existing operating model. To highlight the undetermined future trajectory of the RAF, this section of the thesis also explored the recent proposed developments relating to the entity's operating model that ultimately came to nought. Subsequently, the compulsory road accident insurance arrangements of a collection of nations were explored and juxtaposed against that of South Africa. As one of only a handful of nations other than South Africa to employ a largely PATP-funded scheme, New Zealand's arrangement represented an ideal case for a near-direct comparison. While the insurance arrangement of China is far removed from that of South Africa, the oriental nation's growing receptivity towards private sector participation within the insurance market made for a pertinent discussion. This was followed by an outline of the mandatory vehicle insurance arrangement adopted by the EU, which provides the framework within which the insurance arrangements of many developed nations operate. While complying with this framework, the Italian state has made deliberate efforts to encourage the proliferation of UBI policies as part of its compulsory insurance arrangement and, accordingly, the nation presented itself as an apt case study subject. The common dimensions of interest for the case study research avenue are indicated by yellow shading in Figure 3.1.

In addition to the two primary research avenues, a supplementary discussion relating to UBI product development was prepared. This auxiliary chapter drew upon lessons learnt from the market segment survey as well as other behavioural research conducted in both insurance- and non-insurance contexts with two objectives; (1) to highlight the challenges that UBI providers may face as a result of their

unique tariff structure and (2) to propose strategies for UBI providers aimed at advancing the likelihood of consumer adoption and retention, as well as the extent of societal value cultivated by these policies.

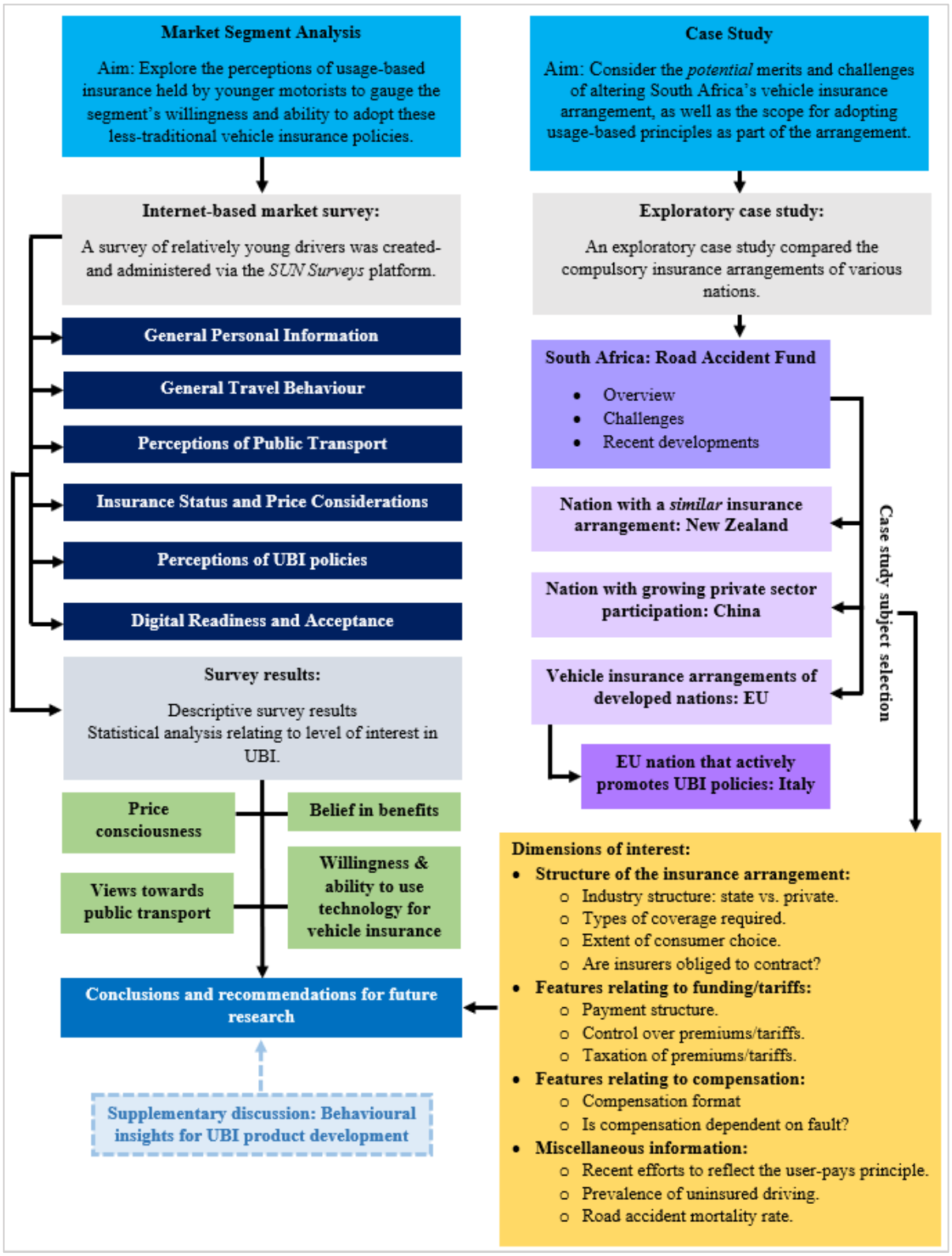

Figure 3.1: An outline of the study.

(Source: Own)

4 MARKET SEGMENT ASSESSMENT SURVEY

This chapter concerns the market segment assessment survey, which explored younger motorists' perceptions of UBI policies. As discussed in the introductory chapter, the survey related principally to UBI in the context of South Africa's existing overarching insurance arrangement, which confines this type of policy to property coverage only.

The chapter begins with an in-depth discussion relating to the methodology employed. This is followed by an exploration of the descriptive results obtained from the survey. Subsequently, attention is turned to the results of statistical analyses that were performed to test for potential differences in the characteristics of- and sentiment expressed by sub-groups of the broader sample. The chapter draws to a close with a recapitulation of the survey results.

4.1 Methodology

In this section of the chapter, the methodology utilised to perform the market segment assessment survey is discussed in detail.

4.1.1 Methodological Overview

The market segment assessment survey was created and administered using the SUN Surveys platform—Stellenbosch University's own Checkbox-based online survey service. This allowed single-use[22] links to the survey to be shared with potential participants via email. Because of the importance of the youthful segment in the context of UBI—discussed in Section 2.5—this cohort was selected as the target population for the survey. To this end, motorists who were above the legal driving age (i.e., 18 years old) and below the age of 35 were eligible for participation. The survey can be found in Appendix A of this document.

4.1.2 Survey Design

The survey was comprised of a total of 91 questions, however, some of the questions would only be visible to respondents based on their answers to other questions[23]. The survey included a mix of single-response-, multiple-response- and scaled-response questions, as well as a single open-ended numerical question.

All scaled-response questions were measured using ten-point interval rating scales. Using numerical labels would ensure that all marginal differences between the values within the scale would be equal—

[22] Single-use links prevent participants from submitting multiple responses using the same invitation. Using links of this nature was deemed necessary, as the participation incentive (discussed in Section 4.1.6) might otherwise have tempted some participants to submit multiple sets of responses in the hope that it would increase their likelihood of achieving financial gain.

[23] The conditions for each question are annotated in Appendix A.

a property that cannot necessarily be assumed with scales that are only labelled verbally. Because many of the questions were expected to elicit contrasting opinions among respondents, most of the rating scales were bipolar in nature. While contrasting responses were expected, the intensity of respondents' opinions could not be predicted. As such, the adoption of ten-point rating scales would allow both the direction- and intensity of opinions to be recorded in a manner that would allow a greater degree of distinction between responses than would have been offered by a scale with fewer choice options. To ensure that respondents would have minimal difficulty in interpreting the direction of the scales, the end-points were given verbal labels in addition to their respective numerical labels. In the case of the bipolar rating scales, the end-points were labelled with either perfect- or near-perfect antonyms of each other to ensure that these labels did not detract from the equidistant numerical intervals.

Respondents were required to submit responses for all questions that they qualified to answer. As mentioned in Chapter 3, the topics covered in the survey could be grouped into six broad categories. These categories can be explained as follows:

- General Personal Information: This category contained objective questions that related to respondents' demographic- and background information, as defined in the Protection of Personal Information Act (POPIA). The answers obtained from this section of the survey were used to describe the sample and provided a starting point for segmentation. All respondents qualified to complete six of this category's 14 questions.
- General Travel Behaviour: This category contained both objective- and subjective questions that related to the usual travel behaviour of respondents. This group of questions allowed insight to be obtained about respondents' travel patterns, as well as their general attitudes towards car usage. Respondents were required to submit responses for all nine of the questions in this category.
- Perceptions of Public Transport: In this category of questions, respondents' opinions of existing public transport were probed. Public transport was reviewed in terms of its perceived *convenience and ease of access*, *safety and security*, *comfort*, *reliability*, *pricing*, *travel time* and *flexibility* using a ten-point scale (with 1 representing "poor" and 10 representing "excellent"). Respondents could also select a "Don't know" option. Respondents were also required to rate the importance of each of these seven aspects when selecting a mode of transport. It must be noted that the questions from this category referred to public transport collectively (as opposed to there being separate questions for each mode). The questions from this category attempted to gauge *if* motorists would be willing to use public transport as an alternative to private vehicles, but did not explore *what* public transport options they would use. All respondents were required to submit responses for each of the 16 questions that comprised this category.

- Insurance Status and Price Considerations: In this category of questions, respondents' vehicle insurance status was asked and opinions relating to vehicle insurance pricing were probed. The importance of costs, as well as respondents' willingness to switch policies, were explored. This category was made up of 15 questions. Respondents were each required to submit responses to between four- and 15 of these questions—depending on their answers to questions within the category.
- Perceptions of UBI Policies: In this section of the survey, respondents were introduced to the concept of UBI policies and their awareness of the existence of this type of policy was explored. After receiving general information about UBI policies, respondents' willingness to adopt policies of this nature was probed and perceptions of some of the potential benefits often ascribed to these policies were explored. This category also explored respondents' perceptions of how certain aspects of driving behaviour influence risk. This category contained a total of 18 questions. Respondents that drove an uninsured vehicle most regularly were required to answer 15 of these questions, while respondents that drove an insured vehicle most regularly were required to answer all 18 questions.
- Digital Readiness and Acceptance: This section of the survey gauged the likelihood of motorists being comfortable with- and adopting the technology required to employ most modern telematics-based UBI policies. Similarly, respondents' level of comfort with having certain aspects of driving behaviour monitored by an insurer was probed. To ensure that these questions were understandable to those with less technological competence, care was taken to exclude jargon where possible. A total of 19 questions made up this category. Respondents had to submit responses to between 14 and 18 questions—depending on their answers to questions from previous categories as well as questions within the category.

4.1.3 Pilot Test

Per van Teijlingen & Hundley (2001) pre-testing research instruments before they are used for their intended purpose(s) can improve the likelihood of a study's success. Before its formal roll-out, the market segment assessment survey was pre-tested among a group of ten staff members and postgraduate students with strong backgrounds in transport-related research from the Department of Logistics and the Department of Economics at Stellenbosch University. The volunteers were asked to complete the survey and provide feedback on its design. This aimed to ensure that the proposed survey tool was comprehensible, adequately unintrusive, relevant for achieving the research objectives and not overly time-consuming. Minor adjustments, such as rewording of questions and restructuring of certain choice options, were incorporated as a result of the pilot test.

4.1.4 Survey Distribution

Single-use invitations were sent to students and staff members from Stellenbosch University via their university-affiliated email addresses. It was not, however, possible to ascertain what proportion of the

invitations were delivered successfully and ultimately read. It was also not possible to limit the distribution of the invitations according to the survey's eligibility criteria, meaning that students and staff members who were not regular motorists and/or above the cut-off age would have also received the invitation. As such, there was no way of knowing how many appropriate potential participants were reached by the invitations.

4.1.5 Ethical Precautions

Prior to the commencement of data collection, ethical clearance was obtained from both the Department of Logistics' *Departmental Ethics Screening Committee* (DESC) as well as the *Research Ethics Committee: Social Behavioural and Education Research* (REC:SBE) of Stellenbosch University[24]. Because the survey was to be sent to students and staff members of Stellenbosch University, it was also necessary to obtain Internal Institutional Permission from the university's Division for Information Governance[25]. Once permission had been attained, the email addresses of staff and students were requested from their respective owners by the Division on the researcher's behalf, before being forwarded directly to the administrator responsible for the SUN Surveys platform. This meant that the researcher was not given direct access to the email addresses.

Before completing the survey, respondents were provided with a general overview of the purpose of the survey, as well as their participant rights. One such right was the freedom to terminate their participation at any point during the survey. Only completed responses would be exported for analysis, while incomplete responses would be ignored entirely. Before accessing the survey, respondents were asked to click on a compulsory on-screen button to confirm that had read- and understood the consent form and that they had agreed to participate. Potential respondents were also asked to click on an additional compulsory on-screen button to confirm that they met the eligibility criteria before they could access the survey. The informed consent template can be found in Appendix C.

The survey did not require participants to divulge any personal identifiers and the questions asked were not intrusive enough for the researcher to link observed results to particular data subjects. Furthermore, responses were analysed at an aggregate level, meaning that responses were not used individually.

All survey responses were securely collected on the researcher's password-protected SUN Surveys profile. Any data that were downloaded for subsequent analysis were stored securely on the researcher's personal- and laboratory computers—both of which are password-protected and used only by the researcher. To prevent potential data losses, the survey data were also backed up on the researcher's personal Google Drive account. This cloud storage location could only be accessed by the researcher.

[24] Proof of ethical consideration can be found in Appendix D of the document.

[25] Proof of institutional permission can be found in Appendix E of the document.

In the section of the survey relating to participants' general personal information, care was taken to ensure that the questions asked would not allow the researcher to obtain any information that could place the confidentiality, safety, or wellbeing of respondents in jeopardy in any way. For example, for the purposes of the study, it was deemed adequate to obtain respondents' residential location at a local/metropolitan- municipality level as opposed to a more specific level. In the questions relating to age, gender and employment status—areas that may have otherwise caused discomfort—it was made clear that "prefer not to answer" was an acceptable choice. In the section relating to participants' general travel behaviour, no questions required respondents to reveal sensitive travel information. Despite road safety's role as a central theme in the broader study, care was taken to omit any questions related to traumatic road transport experiences, such as road traffic accidents and their implications. Participants were at no point asked- or expected to dwell upon any negative occurrences that they may have experienced in the past. Furthermore, the questions asked did not require respondents to share any overly sensitive information or views that may have been considered controversial. As such, the researcher does not believe that respondents would have experienced any discomfort as a result of their participation in the survey.

It was decided that the raw data obtained from the market segment assessment survey would not be shared with any other researchers after the completion of the study. Only the published, aggregated results will be available to interested parties.

4.1.6 Participation Incentive

As an incentive to encourage participation in the survey, which would take approximately ten-to-fifteen minutes to complete, three cash prizes valued at ZAR 500 each were randomly awarded to willing participants after the data collection had been completed. To be eligible for this lucky draw, willing participants had to share their contact details via a separate survey that was linked to the main survey. This prevented the researcher from being able to link the contact details of participants with their survey responses—allowing anonymity to be ensured. Participants who did not want to share their contact details despite this anonymity could opt to respond to the survey without taking part in the lucky draw. In the event of a winner of the lucky draw not responding to attempts made by the researcher to notify them of their prize within one week of the initial notification, a new winner would be randomly drawn.

4.1.7 Data Preparation

Before the analysis of responses could begin, it was necessary to undertake various preparatory steps. Much of this process was completed to expedite the subsequent analysis but was not necessarily relevant for discussion in the thesis itself. Examples of such steps included adding variable- and value labels and ensuring that all variables were classified according to their appropriate levels of measurement.

Because individuals who either did not give their consent to participate or indicated that they did not meet the participation criteria were not able to access the actual survey, their respective rows of empty

cells were removed from the dataset prior to the analysis. Similarly, incomplete responses were removed. In addition, it was necessary to remove a small share of responses that appeared to be spurious. For example, a handful of respondents simultaneously indicated that they had not heard of UBI policies before *and* that they were currently subscribed to UBI policies. Similarly, some respondents indicated dubious average weekly travel distances (some in excess of 10,000 kilometres). It was deemed appropriate to discard all responses obtained from these respondents. After these spurious responses had been removed, a total of 565 usable responses remained. Because some questions allowed respondents to submit open-ended answers, these responses were inspected manually and, where appropriate, re-categorised. These manual resolutions are outlined in Appendix F.

A handful of nominal variables were derived from those that were automatically produced by SUN Surveys. These variables served to:

- Classify respondents as residents of either local- or metropolitan municipalities;
- Indicate whether a respondent held some form of employment (i.e., at least one part-time *or* full-time position);
- Categorise each respondent into one of three sub-groups based on their level of interest in UBI with consideration for multiple aspects of driving behaviour;
- Combine the responses relating to the use of online banking services obtained from individuals who either owned- or did not own a smartphone.
- Distinguish between relatively high-VKT drivers (more than 20,000 kilometres per annum) and all other respondents.
- Distinguish between respondents who owned the vehicle that they used most regularly and those who did not.
- Distinguish between respondents who were responsible for selecting the insurance policy for the vehicle that they used most regularly and those who were not.
- Distinguish between respondents who were particularly young (younger than 23) and all other respondents.
- Distinguish between respondents who had access to multiple motor cars and those who had access to a single motor car.

4.1.8 Data Analysis

Using SUN Surveys to administer the survey allowed the results to be exported in an IBM Statistical Package for the Social Sciences (SPSS) compatible comma-separated values (CSV) format.

Two broad categories of analyses were performed. In the first of these categories—found in Section 4.2—descriptive statistics relating to the survey results were calculated, presented and discussed at length. Where applicable, these results were exhibited graphically using pie charts and various types of bar charts.

The second category of analyses—presented in Section 4.3—involved the use of various statistical tests to establish whether statistically significant differences existed in the characteristics of- and sentiment expressed by sub-groups of the broader sample. To this end, the sample was segmented into three independent sub-groups based on their level of interest in UBI policies that include consideration for multiple aspects of driving behaviour[26]. The sub-groups were defined as follows:

- Forerunners: Those who indicated that they have either already subscribed- or would definitely consider subscribing to a UBI policy *(n=183)*.
- Non-Partisans: Those who indicated that they would be somewhat interested in subscribing to a UBI policy *(n=209)*.
- Laggards: Those who indicated that they would either most likely not- or definitely not be interested in subscribing to a UBI policy *(n=173)*.

To test if sentiment—measured using an interval rating scale—differed between the independent sub-groups, a series of Kruskal-Wallis H tests were employed. The test statistics presented included adjustments for ties, as carried out automatically by SPSS. In cases where statistically significant results were observed in these non-parametric omnibus tests at the five percent significance level (i.e., $p<0.05$), post-hoc Dunn-Bonferroni[27] tests were conducted on each pair of sub-groups. In instances where the omnibus tests yielded significant differences, the results were visualised using boxplots.

To test for the existence of significant associations between categorical variables that related to respondents' characteristics and their level of interest in UBI, a series of cross-tabulations were constructed and associated Chi-square tests were performed. In instances where associations emerged at the five percent significance level, pairwise Bonferroni-adjusted z-test post-hoc tests were conducted to identify the source(s) of the significance.

All statistical analyses were conducted using IBM SPSS 27 and graphically-presented results were created using Microsoft Excel. Unless otherwise stated, all mention of statistical significance referred to the five percent significance level.

4.1.9 Potential Methodological Limitations

It is acknowledged that the results obtained from the sample may not necessarily be representative of the total population of younger drivers in South Africa for a handful of reasons, each discussed below.

[26] Respondents' levels of interest in two types of UBI policy were probed as part of this study. Descriptive results relating to these responses can be found in Section 4.2.5.

[27] The Bonferroni correction was applied to ensure that the familywise error rate (i.e., the likelihood of making at least one Type I error) remained acceptably low when multiple comparisons were carried out.

Selection bias, stemming from the use of an online platform to conduct the survey (Bethlehem, 2010), may have materialised. This is particularly relevant in the section of the survey that explored the digital readiness of the market segment. Owing to this, the results may be somewhat influenced as a result of the survey not being accessible to those who either did not have access to- or were unable to operate a smartphone or computer. In the survey of 1,500 vehicle insurance policyholders conducted by Accenture (mentioned in Section 2.4), it was observed that only one percent of respondents did not own a smartphone and 96 percent of respondents reported that they browsed the internet at least once per week using a computer (Accenture, 2016). As a result of the widespread proliferation of smartphones and computers, the researcher does not believe that the effect of this selection bias would have been large enough to undermine the results significantly. The looming risks associated with the COVID-19 Pandemic also precluded data collection through in-person surveys, meaning that some degree of compromise was necessary.

Because the intended sample was relatively young, it was anticipated that a large cohort of respondents would not be the owners of the car that they used most regularly. As such, it came as no surprise that not all respondents knew whether the vehicles that they used most regularly were insured and that a fairly large group was not yet responsible for making insurance decisions. As alluded to in Section 2.5, it is likely that a noteworthy share of the youthful cohort will be selecting an insurance policy for the first time in the coming years. With local insurers showing a growing interest in UBI propositions, it is probable that many of these young motorists will be making choices relating to their own insurance in parallel with the launch of new UBI options. Accordingly, the views of these young motorists were deemed to be of value.

Because the survey was distributed to staff and students from Stellenbosch University, it was not unexpected that the majority of results originated from the Western Cape. It is possible that some results may have been distorted by this, as regional differences may exist in individuals' travel- and insurance decisions. Similarly, public transport differs extensively across South Africa, meaning that the perceptions of public transport obtained from the sample may be influenced unduly by respondents from certain regions.

Some respondents could possibly have been influenced by social desirability bias and, as a result, answered certain questions in ways that they believed would be viewed favourably (Krumpal, 2013). To limit this effect, the researcher made a concerted effort to ensure that respondents were aware that their answers would be entirely anonymous. Despite this anonymity, it is also possible that respondents may have been influenced by self-deception (Sinclair, 2013). For example, driven by overconfidence in their ability to improve their driving behaviour, respondents may have eagerly indicated a willingness to consider signing up for a UBI policy while, in reality, changes of this nature can be fairly sticky over the short- to medium term.

It is possible that the invitations may have been forwarded by their initial recipients to other individuals. Because of the inherent nature of single-use invitations, this would mean that only one recipient per invitation (i.e., either the original recipient or an individual who received a forwarded invitation) would be able to access the survey and submit a response. Provided that those who accepted the invitation and completed the survey were eligible to participate (i.e., they completed the consent form and survey honestly), this should not be viewed as problematic. It does, however, mean that the researcher does not have absolute certainty over who completed the survey.

4.2 Descriptive Survey Results

In this section of the thesis, the descriptive results obtained from the market segment assessment survey are explored in detail. This section of the chapter contains six sub-sections—one for each of the six categories of questions contained in the survey.

4.2.1 Respondent Characteristics

The sample was characterised by a considerable share of respondents from the Western Cape, as presented in Figure 4.1. At a metropolitan/local municipality level, the six most common primary places of residence for respondents were Cape Town, Stellenbosch, Drakenstein, Johannesburg, Tshwane and George. Approximately 52.9 percent of respondents resided in one of the country's eight metropolitan municipalities, while the remaining 47.1 percent hailed from local municipalities.

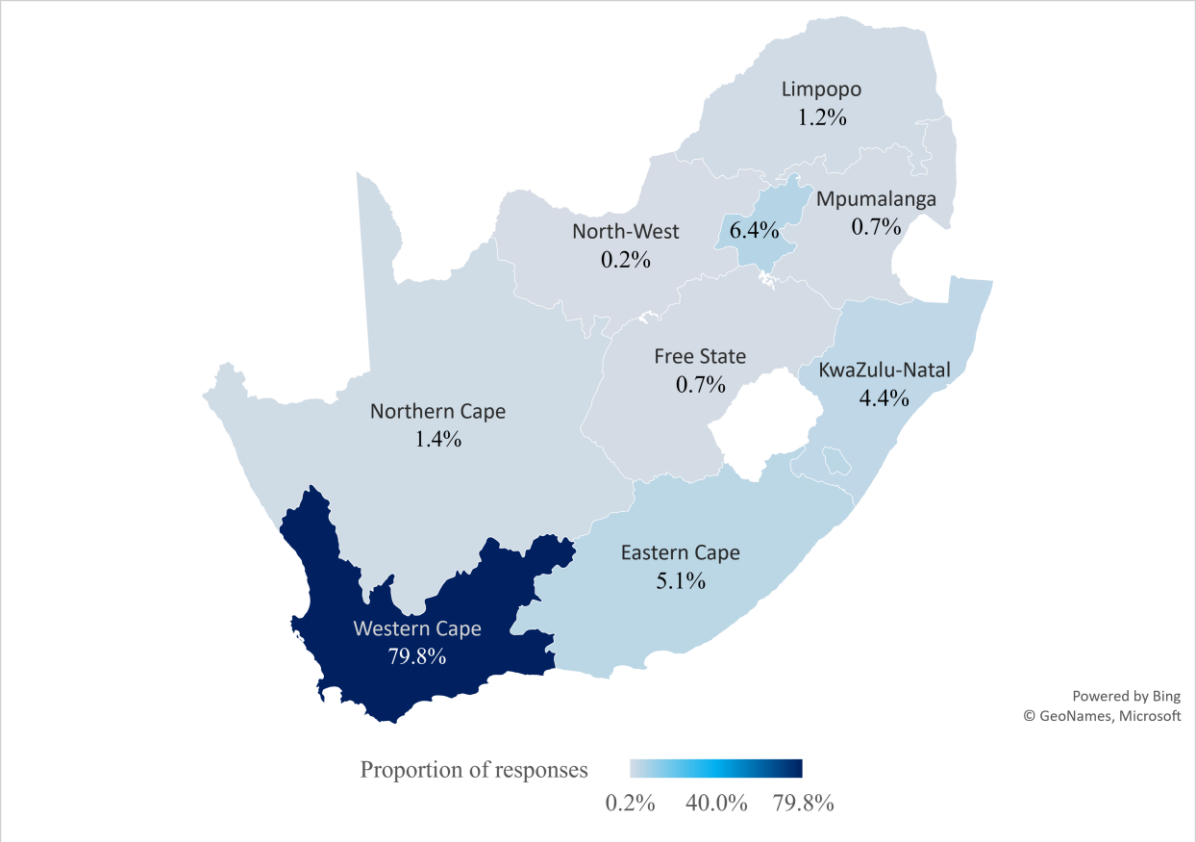

Figure 4.1: Distribution of responses by province.

(Source: Own)

A slight imbalance existed in the sample's female-male ratio. Fifty-seven percent of the sample was comprised of females, while 42.5 percent of respondents identified as males. This, coupled with the fact that a considerably larger proportion of males are in possession of a South African driver's license (Statistics South Africa, 2016:24), *may* suggest that females were somewhat overrepresented in the sample. This suspicion could not, however, be confirmed, as data relating specifically to the gender ratio of young licence-holders were not readily available. Of the remaining respondents, one identified as non-binary and two preferred not to share their gender. The mean age of respondents was 23.3 years, while the 25th-, 50th- and 75th percentiles were 20.0, 22.0 and 25.0 respectively. Figure 4.2 summarises the age and gender breakdown of the 562 participants who were willing to indicate their identified gender and did not identify as non-binary.

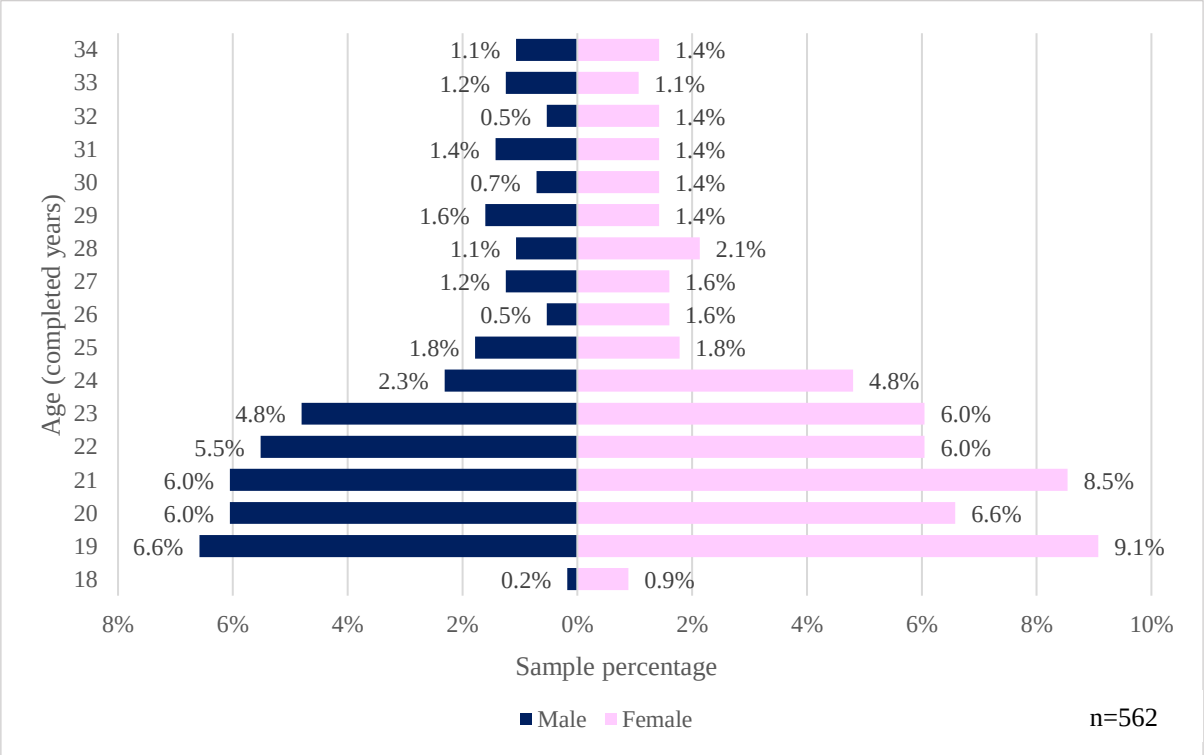

Figure 4.2: Age and gender breakdown of the sample.

(Source: Own)

Approximately 21.6 percent of the sample indicated that they held some form of employment (either full-time or part-time) at the time of completing the survey. This low proportion can, in part, be explained by the large proportion of respondents who were studying full-time and, as such, were either yet to enter the labour market or had taken a career hiatus while studying.

The vast majority (approximately 71.5 percent) of respondents indicated that they either owned, leased or had regular access to a single motor car, while less than ten percent owned, leased or had regular access to three or more motor cars. Approximately 31 percent of respondents indicated that they owned the motor car that they drove most regularly, while 62 percent of respondents drove vehicles owned by

their parents/guardians most regularly[28]. This result was not unexpected, owing to the considerable proportion of the sample that was engaged in full-time studies and unlikely to be financially independent. Figure 4.3 provides further information relating to vehicle access and ownership.

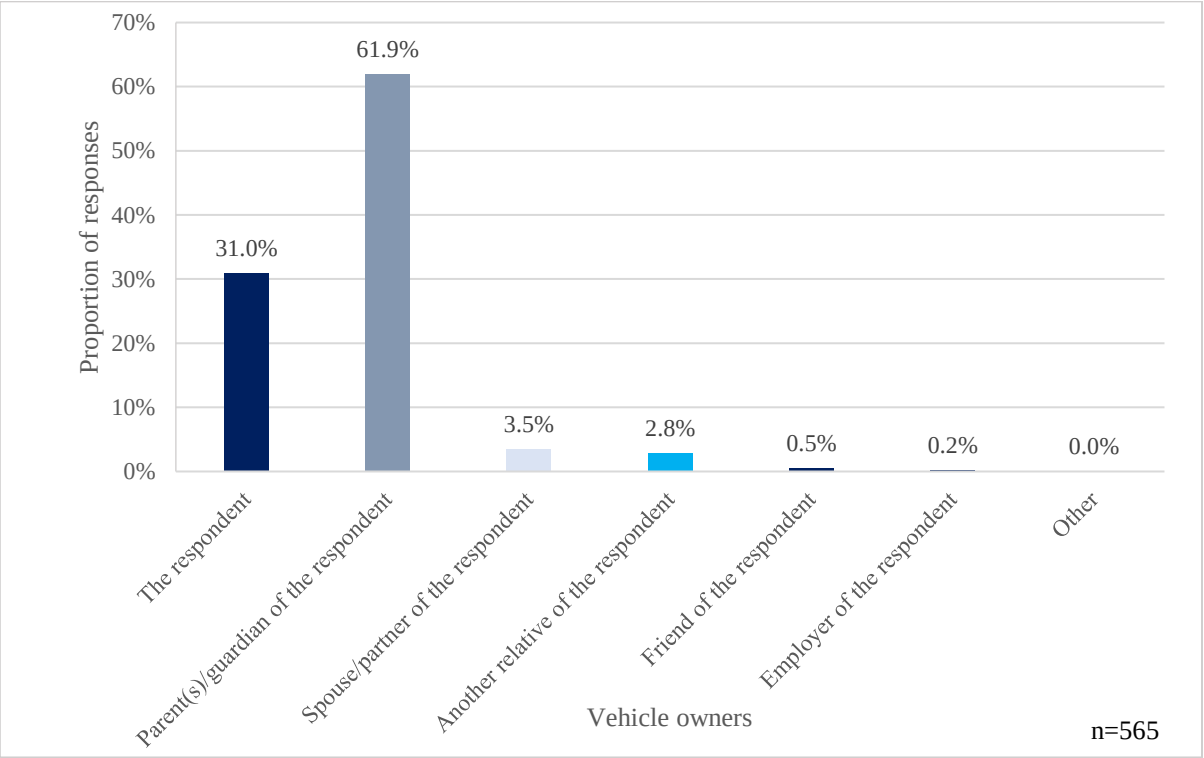

Figure 4.3: Breakdown of the owners of the vehicles used most regularly by respondents.
(Source: Own)

4.2.2 General Travel Behaviour

Not unexpectedly, respondents displayed a large degree of variation in their estimates of their usual weekly travel distances. These VKT estimates should, however, be viewed with a hint of scepticism, as it has been shown that individuals tend to have difficulty judging travel distances and tend to base their distance estimates on travel times (Bonsall, Shires, Matthews, Maule & Beale, 2004:23). It is also worth noting that respondents were asked to provide an estimate of what their usual weekly travel distance was before the outbreak of COVID-19 in South Africa. Because the survey was rolled out more than half a year after South Africa's initial COVID-19-induced lockdown, it is plausible that individuals may have had difficulty recalling their pre-pandemic travel distances. Figure 4.4 presents the sample's weekly travel estimates in the form of a cumulative percentage distribution. Descriptive statistics relating to the central tendency and dispersion of respondents' weekly travel distance estimates are presented in Table 4.1.

[28] It is expected that a share of these vehicles are used almost exclusively by the respondents, but are formally owned by their parents/guardians for reasons such as financing and/or favourable insurance premiums.

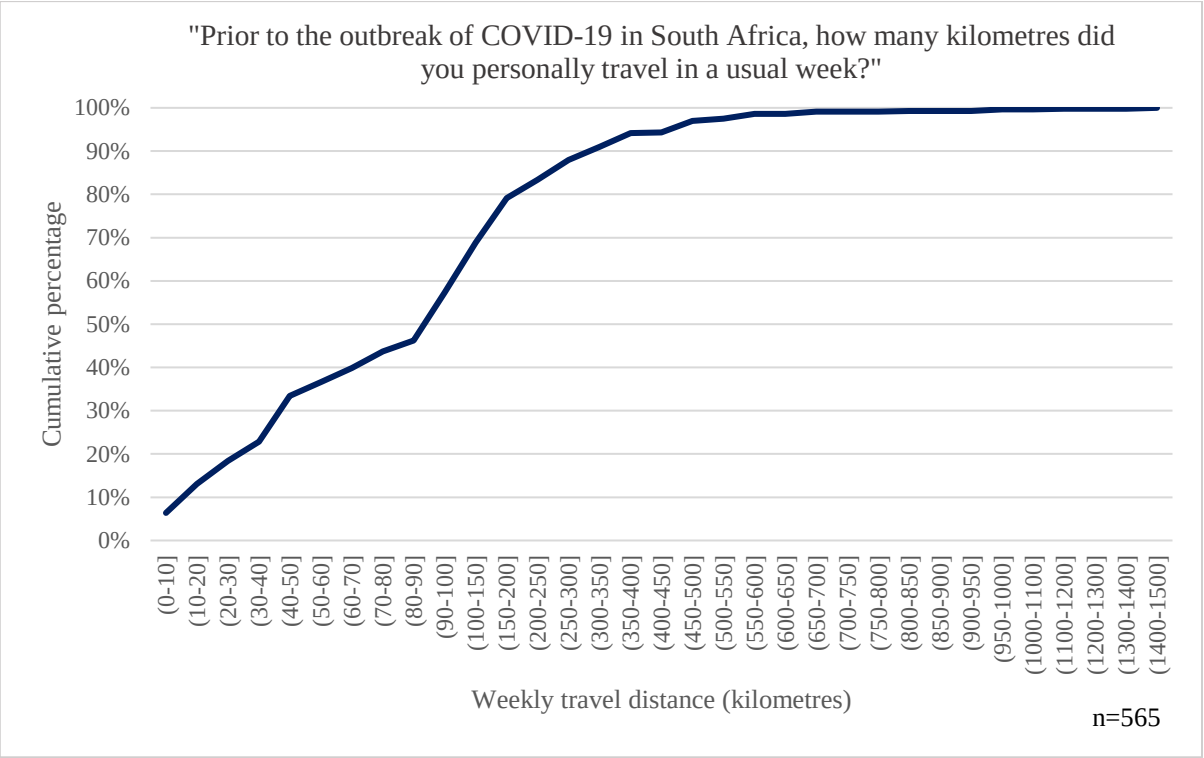

Figure 4.4: Cumulative percentage distribution of respondents' weekly travel distances.

(Source: Own)

Table 4.1: Descriptive statistics relating to respondents' estimated weekly travel distances.

"Prior to the outbreak of COVID-19 in South Africa, how many kilometres did you personally travel in a usual week?"	
n	565
Mean	150.43
Standard Deviation	164.61
Percentile 25	50.00
Percentile 50	100.00
Percentile 75	200.00

(Source: Own)

Despite relatively low levels of car ownership among the sample, the vast majority (82.5 percent) of respondents indicated that they used private motor cars as their primary mode of transport. Non-motorised transport was the second most popular primary mode—constituting 11.2 percent of responses. Only four out of the 565 respondents in the sample used any form of public transport as their primary mode—three of which relied most on minibus taxis and one of which used a train service. When asked which mode respondents would use if their primary mode were to become unavailable, 61.2 percent of individuals indicated that they would either share lifts (with either a spouse/partner or by means of carpooling) or make use of an e-hailing service. This result was particularly noteworthy, as most

respondents would still rely on privately-owned car-based transport if the vehicle that they used most regularly were to become unavailable. Only a handful of participants indicated that they would shift to one of the options offered by the public sector—an early suggestion of perceived inadequacy. These distinctive results are apparent in Figure 4.5.

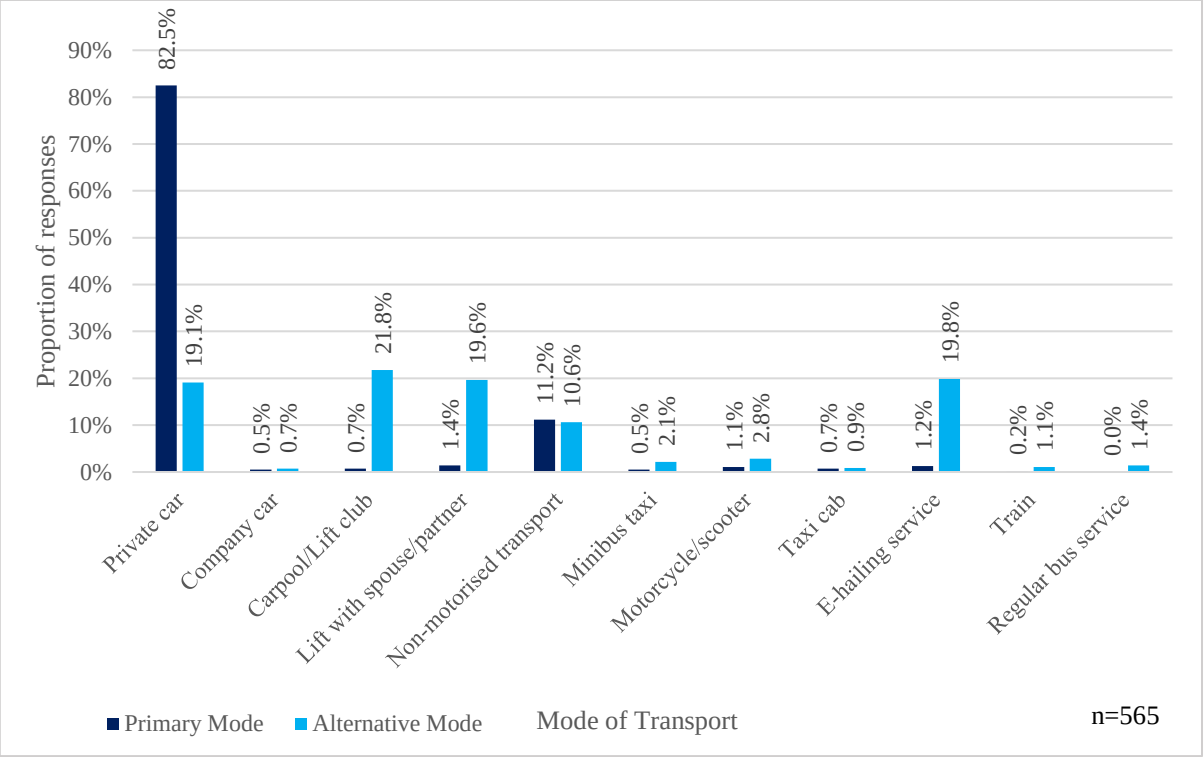

Figure 4.5: Respondents' primary- and alternative modes of transport.
(Source: Own)

More than two-thirds of the sample travelled to their usual daily responsibilities alone, while 24.2 percent of respondents travelled with someone else. The remaining 7.4 percent of respondents indicated that they did not need to leave their homes to complete their usual daily responsibilities. It must be noted, however, that the COVID-19 pandemic and its impacts on working arrangements may have long-lasting- and significant impacts on individuals' travel frequency, as well as their willingness to share lifts.

Most respondents indicated that their weekly travel patterns were relatively consistent, as is illustrated in Figure 4.6. This suggested a degree of adherence to routine among most participants, which may make achieving VKT curtailment somewhat challenging.

As seen in Figure 4.7, a clear majority of the sample resolutely indicated that they do not like to rely on others for lifts. Just 14.5 percent of respondents were inclined to disagree with this sentiment (i.e., selected a response from one to five), suggesting that most of the sample may look unfavourably upon carpooling as a means to achieve VKT reductions.

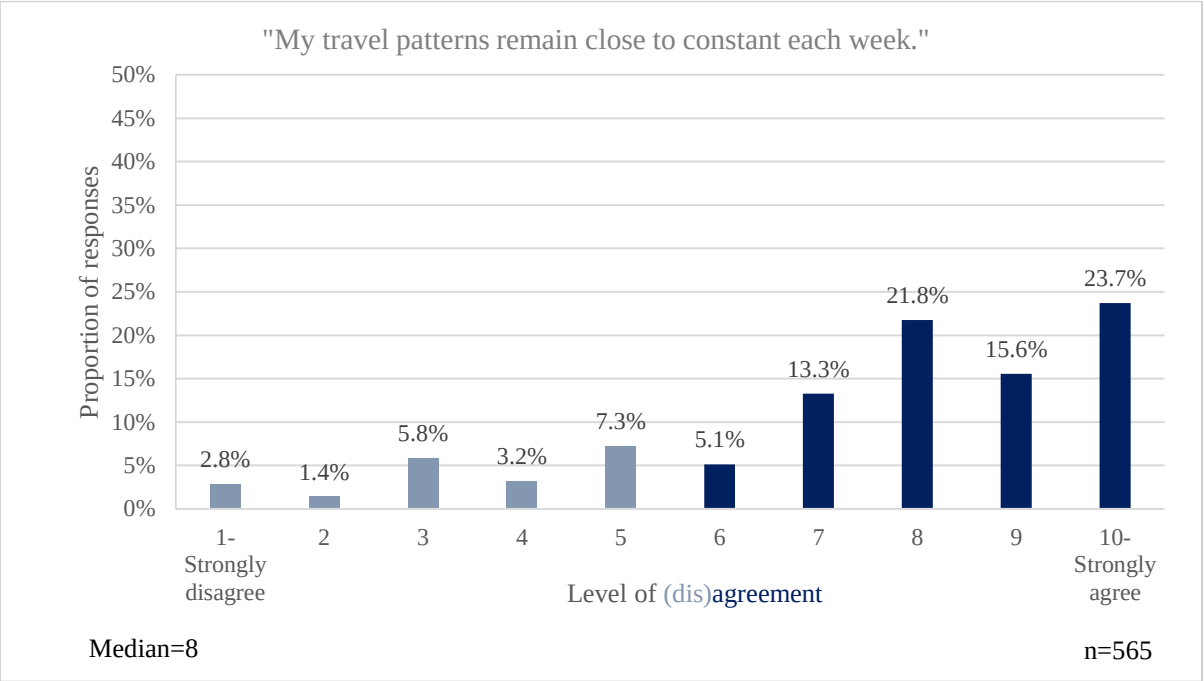

Figure 4.6: Regularity of respondents' travel patterns.

(Source: Own)

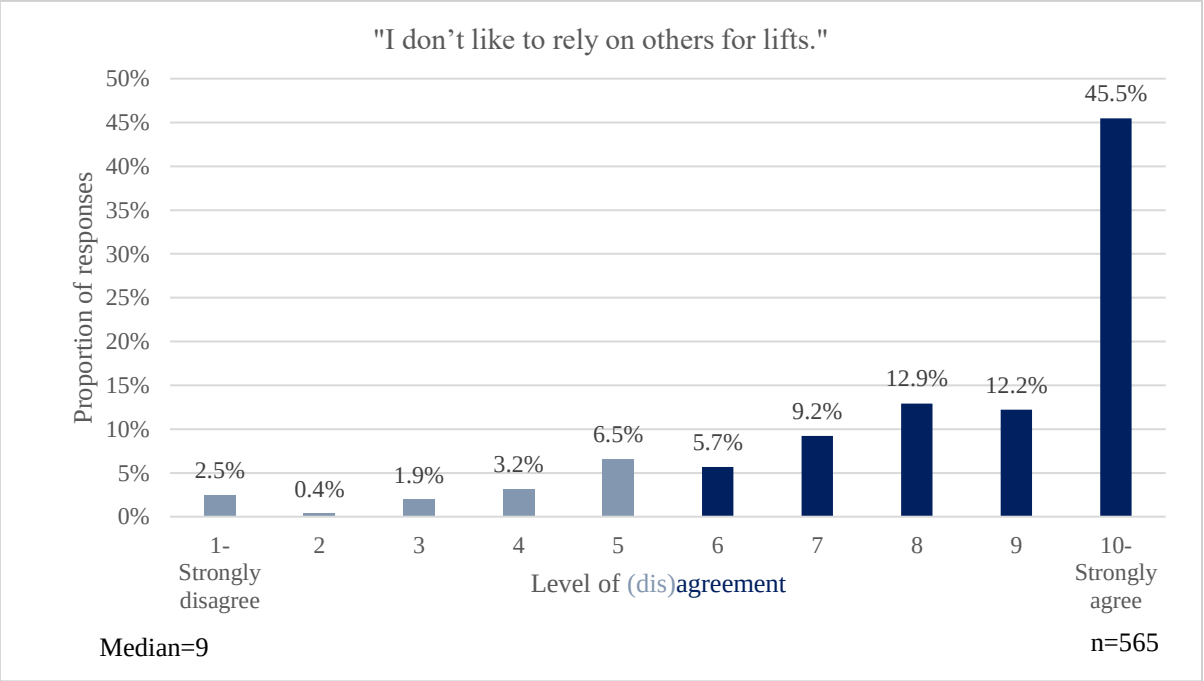

Figure 4.7: Respondents' preference for independent transport.

(Source: Own)

A considerable majority of respondents also strongly agreed that they enjoyed the flexibility afforded by having access to a car—as seen in Figure 4.8. Just six respondents were inclined to disagree with this view—all of which showed only slight disagreement. These findings are important in the context of

UBI, as policyholders may have to sacrifice a degree of this flexibility and independence if they are to achieve savings on their premiums.

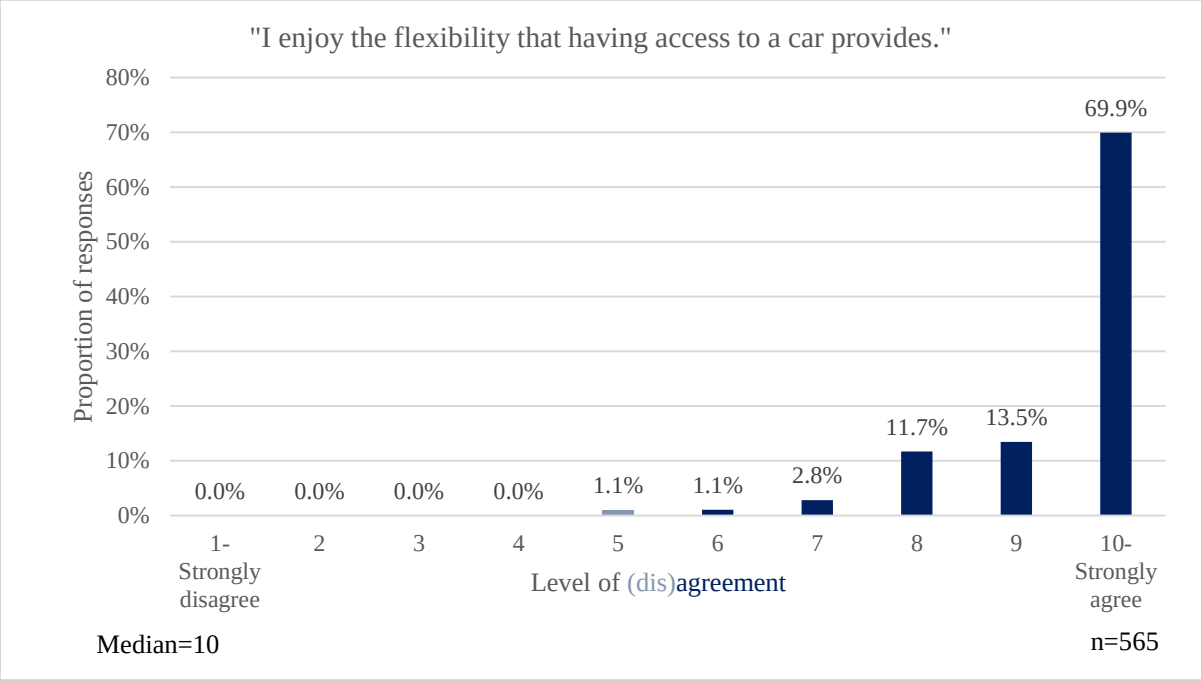

Figure 4.8: Respondents' attitudes towards motor car flexibility.

(Source: Own)

Most respondents—perhaps unexpectedly—indicated that they enjoyed driving. It might be that respondents typically considered their travel to be indispensable and viewed this as a question of their enjoyment relative to their alternative travel options. If respondents did, in fact, derive enjoyment from driving and were to subscribe to a UBI policy, it might be that they would have to forfeit a degree of this pleasure to benefit from premium savings[29]. This result is presented in Figure 4.9.

UBI policies that integrate multiple aspects of driving behaviour into rate-making calculations are commonly marketed towards self-identifying "good drivers". As such, respondents' self-perceptions of their own driving behaviour were of interest to the researcher. In line with similar findings from both South African- and global contexts, most respondents appeared somewhat conceited about their driving ability. A mere 80 participants—equivalent to just 14.1 percent of respondents—were inclined to disagree with the statement posed. Because of this near-ubiquitous sense of confidence—apparent in Figure 4.10—this marketing approach would likely garner fairly widespread appeal among the segment studied. The topic of confidence as a basis for mass appeal is revisited in Section 5.6 of the thesis.

[29] This would, however, be determined by the aspects of driving behaviour that are considered as part of the policy, as well as the aspects of driving behaviour that motorists enjoy.

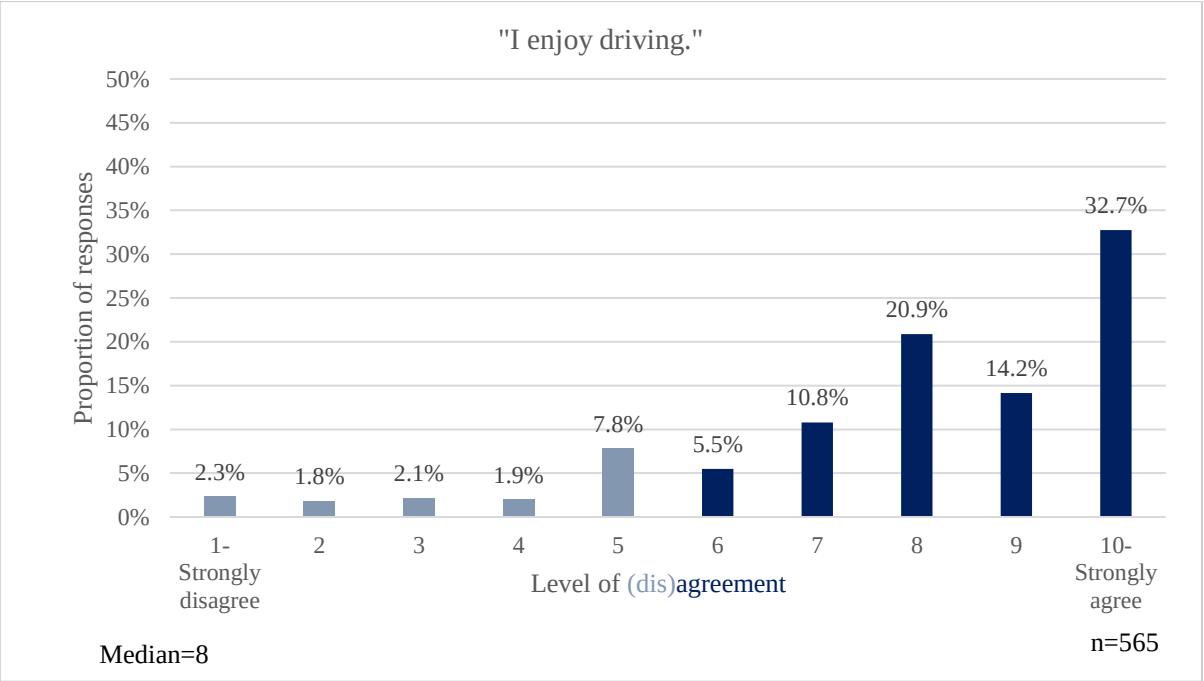

Figure 4.9: Respondents' attitudes towards driving.

(Source: Own)

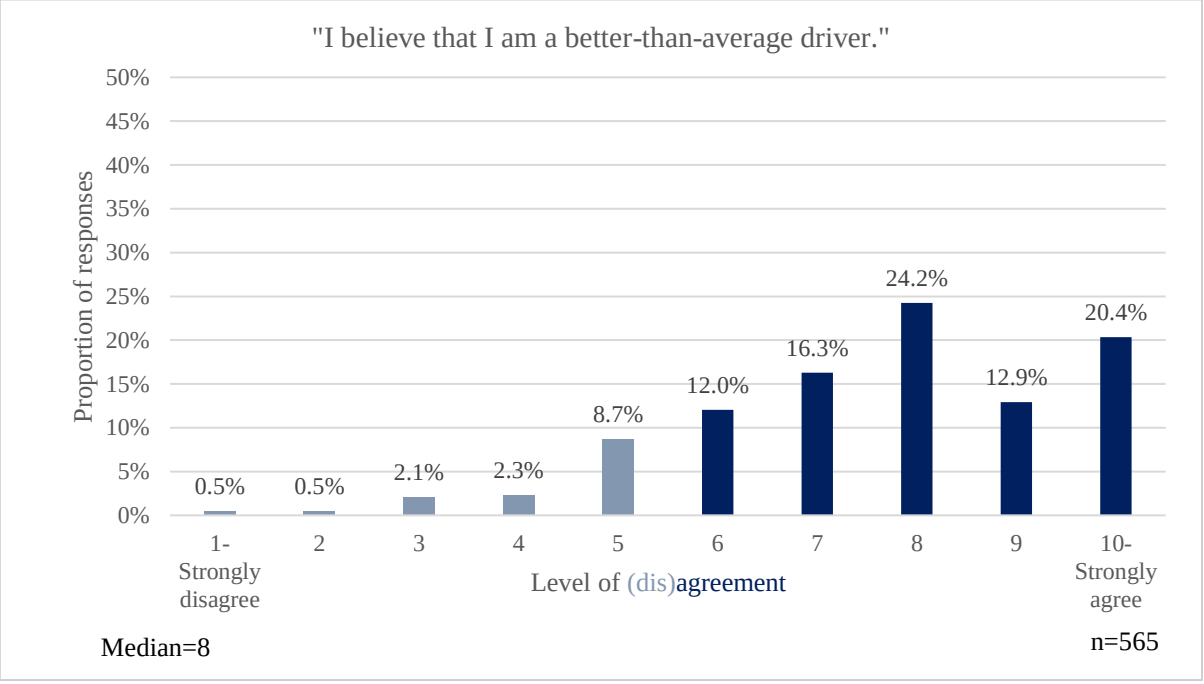

Figure 4.10: Respondents' perceptions of their own driving ability.

(Source: Own)

4.2.3 Perceptions of Public Transport

Respondents were asked to rate the quality of public transport in their area in terms of seven attributes. Descriptive statistics relating to the responses are presented in Table 4.2. It is worth noting that the modal choice relating to each of the seven attributes was “Don’t know”. This, combined with the insight obtained from the questions relating to respondents’ primary- and secondary modes, may lead one to

believe that a large share of the sample either never- or very rarely makes use of public transport. As seen in Figure 4.11, most respondents did, however, demonstrate a strong willingness to use public transport more often if its quality were to improve markedly. Despite this willingness to use an improved public offering, 52.2 percent of respondents were, with varying levels of disapproval, against the idea of relying wholly upon public transport as a substitute for private vehicle use, as seen in Figure 4.12.

Table 4.2: Perceived quality of public transport.

Attribute	Quality Scores (1 = Poor; 10 = Excellent)			Frequency (proportion) of "Don't Know" responses
	Mean	Median	Mode[30]	
Convenience and ease of access	5.05	5.00	5.00	130 (23.0%)
Safety and security	4.00	4.00	1.00	122 (21.6%)
Comfort	3.99	4.00	4.00	141 (25.0%)
Reliability	4.26	4.00	1.00	133 (23.5%)
Value for money	5.94	6.00	8.00	176 (31.2%)
Travel time	4.56	5.00	5.00	175 (31.0%)
Flexibility	4.21	4.00	3.00	172 (30.4%)
n	565			

(Source: Own)

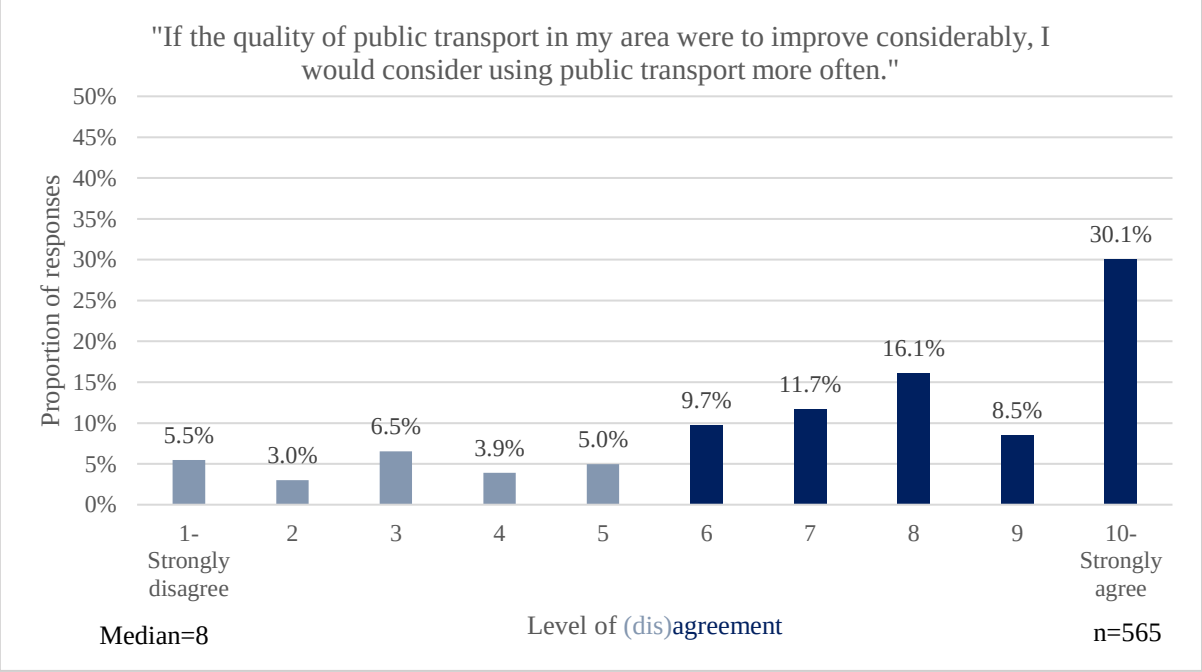

Figure 4.11: Respondents' willingness to use an improved public transport system.

(Source: Own)

[30] The calculation of these measures of central tendency excluded all “don’t know” responses.

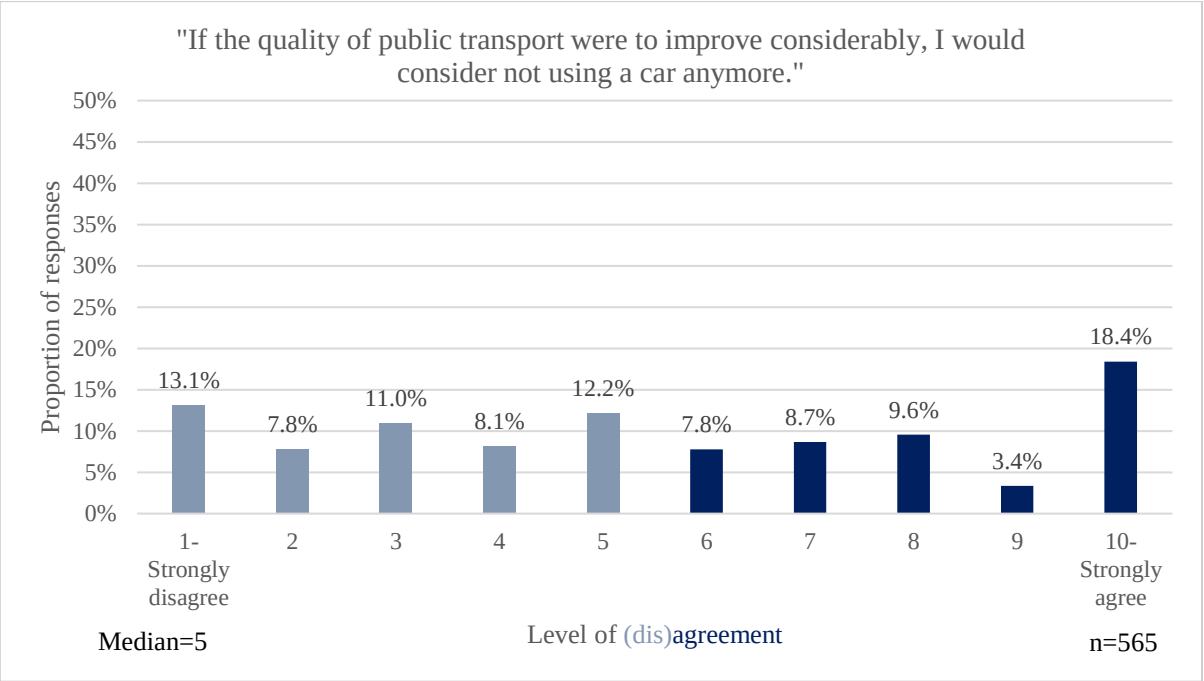

Figure 4.12: Respondents' willingness to wholly substitute private motor car use with an improved public transport system.

(Source: Own)

In addition to perceptions of the performance of public transport in terms of certain attributes, the survey gathered respondents' opinions of the importance that those attributes have when modal choices are made. This allowed for comparisons to be made between importance and perceived performance—a widely used (Lai & Hitchcock, 2015) illustrative managerial technique first proposed by Martilla & James (1977). Because all public transport was considered collectively, the results of this rudimentary analysis are not intended to inform decisions relating to the improvement of public transport and associated resource prioritisation, but rather to highlight the performance inadequacies that may hinder choice ridership. This illustration is presented in Figure 4.13. In this figure, the coordinates of each attribute were determined by the mean performance- and importance scores obtained from the 333 respondents who rated the performance of all attributes under consideration (i.e., all responses obtained from those who selected "Don't know" in one or more performance attributes were ignored). The cross-section was placed based on the grand means of the performance- and importance scores for all attributes. Because the cross-section was placed based on relative scores, care should be taken when interpreting the results, as the quadrants that represent relatively high scores may yet have low scores in absolute terms or vice versa. For example, a general mismatch appears to exist between performance and importance in all of the attributes under consideration, leading to different scales being used on each axis. Without careful inspection, this may lead one to view the performance scores more positively than one ought to.

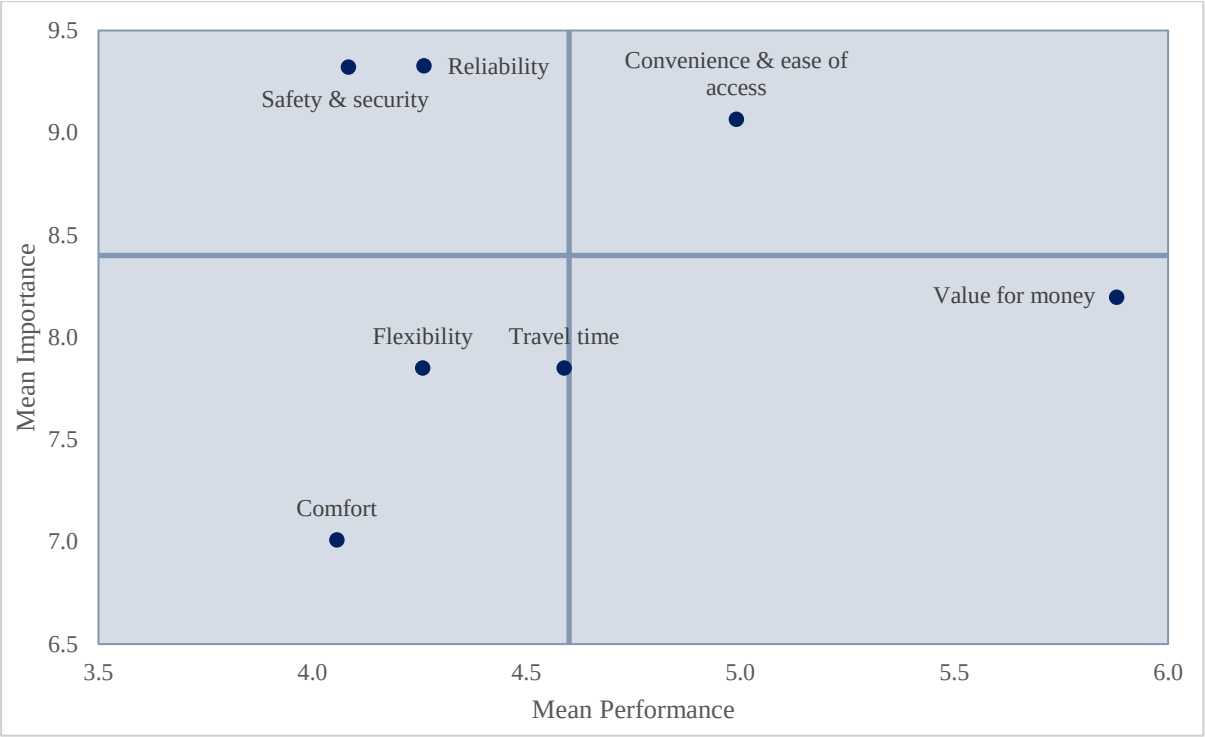

Figure 4.13: Importance-performance matrix relating to respondents' perceptions of public transport.

(Source: Own)

Based on the generally-lacklustre sentiment towards public transport, one might reason that the perceived quality of public transport inhibits its use among travellers who have the choice to use private vehicles instead. Of particular concern is the apparent mismatch between the scores given to *reliability* and *safety and security* in terms of importance and performance. The results suggested that VKT reductions achieved through modal shifts to public transport are generally unlikely, given the current state of the public transport system. This would imply that UBI policyholders who intend to reduce their premiums may need to turn to other strategies for VKT reductions, such as the curtailment of discretionary trips, carpooling or the use of non-motorised transport. Whether disparity exists between the actual- and perceived performance of public transport remains beyond the scope of the research.

4.2.4 Insurance Status and Price Considerations

Approximately 88.0 percent of respondents indicated that the car that they drove most regularly was insured. This is a significantly greater proportion than that of the domestic vehicle fleet as a whole. A further 3.7 percent of the surveyed participants indicated that they were unsure of the insurance status of their most regularly used vehicle. Among the drivers of insured vehicles, 58.6 percent indicated that the car that they used most regularly was covered by a comprehensive insurance plan. A further 13.0 percent of insured vehicles referred to by respondents either had *third-party* coverage or *third-party, fire & theft* coverage. It is worth noting that a significant portion (28.4 percent) of respondents were unsure of what type of coverage the car that they used most regularly had. This was not an unexpected result,

given that a large proportion of the sample did not own the vehicles that they used most regularly. Among insured vehicle owners, close to three-quarters of respondents had comprehensive coverage, while 15.8 percent had some form of third-party coverage. These proportions are presented in Figure 4.14.

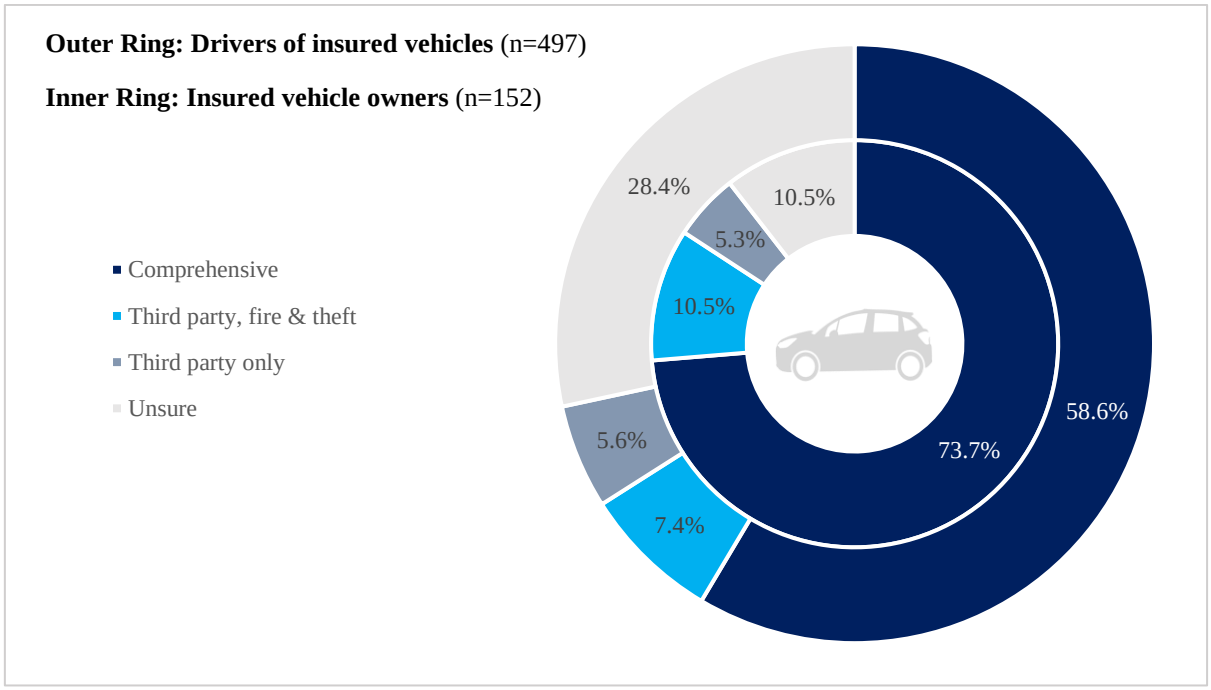

Figure 4.14: Type of insurance policy that covered the vehicles used by respondents most regularly.
(Source: Own)

Approximately 52.4 percent of the drivers of insured vehicles indicated that the vehicles' insurance policies had not been changed within the last two years, while 19.5 percent of respondents were not sure whether a change had been made. Of the 91 respondents that indicated that a policy change had taken place within this period, 63.7 percent cited price as an important reason for this change. Among insured vehicle owners, approximately 24.3 percent of respondents indicated that a policy change had taken place within the previous two years, with more than three-quarters of these respondents indicating that price was an important justification for this change.

Among the 95 drivers who were directly responsible for making insurance decisions, 78.9 percent showed a willingness to change their current policy to achieve premium savings. When these respondents were asked to indicate the percentage saving on their current premiums would be enough to incite a change to a different policy, the mean response was 21.9 percent. A fairly wide range of values was, however, obtained in response to this question. Summary statistics obtained from this question are presented in Table 4.3. Owing to the limited number of responses obtained from this question, caution should be exercised when drawing conclusions from the observed results.

Table 4.3: Summary statistics to describe the percentage saving required to incite policy change among drivers who were directly responsible for making insurance decisions.

n		75
Minimum		2.0
Maximum		50.0
Mean		21.9
Median		20.0
Mode		20.0
Percentiles	**25**	15.0
	50	20.0
	75	30.0
Standard Deviation		10.8
Standard Error of Mean		1.2

(Source: Own)

Perhaps expectedly, the sample was largely bifurcated in terms of respondents' awareness of the premiums linked to their most-regularly used vehicles, as can be seen in Figure 4.15. In other words, respondents were generally either in strong agreement- or strong disagreement that they knew the exact cost associated with the coverage on the vehicle that they used most regularly. Even among insured vehicle owners, 29.6 percent of respondents were inclined to disagree that they knew the exact costs of coverage relating to their own vehicle.

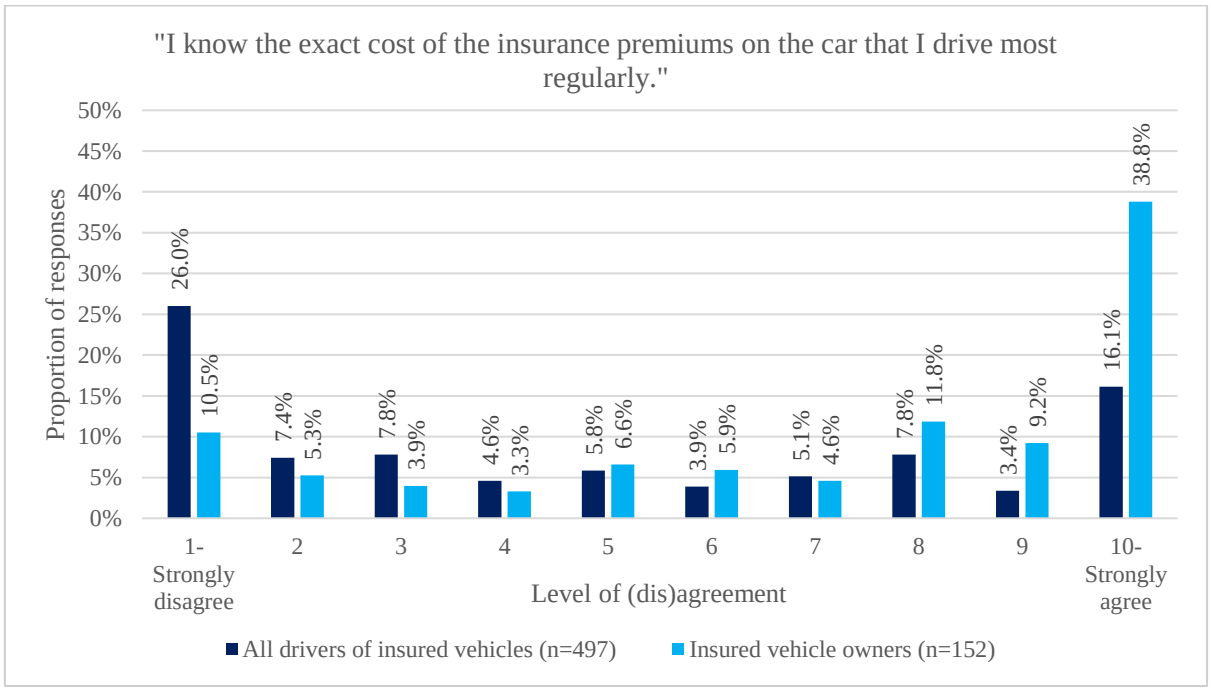

Figure 4.15: Respondents' awareness of the costs associated with insuring the car that they used most regularly.

(Source: Own)

Because of the uncertainty described above, additional series were added to the subsequent graphs from this category of questions so that the results obtained from only those who were relatively confident in their knowledge of the cost of coverage (i.e., those who selected 8, 9 or 10) could be viewed in isolation.

A large proportion of the sample shared perceived uncertainty concerning how the premiums relating to their most-regularly used vehicle were determined by the insurer, as is apparent in Figure 4.16. This is not unexpected, given that most respondents did not know the exact cost of their premiums. Even among insured vehicle owners, more than 40 percent of the respondents were inclined to disagree with the statement posed. Considerably clearer self-perceived understanding was, however, recorded among those who had indicated that they knew the cost of coverage with relatively strong conviction.

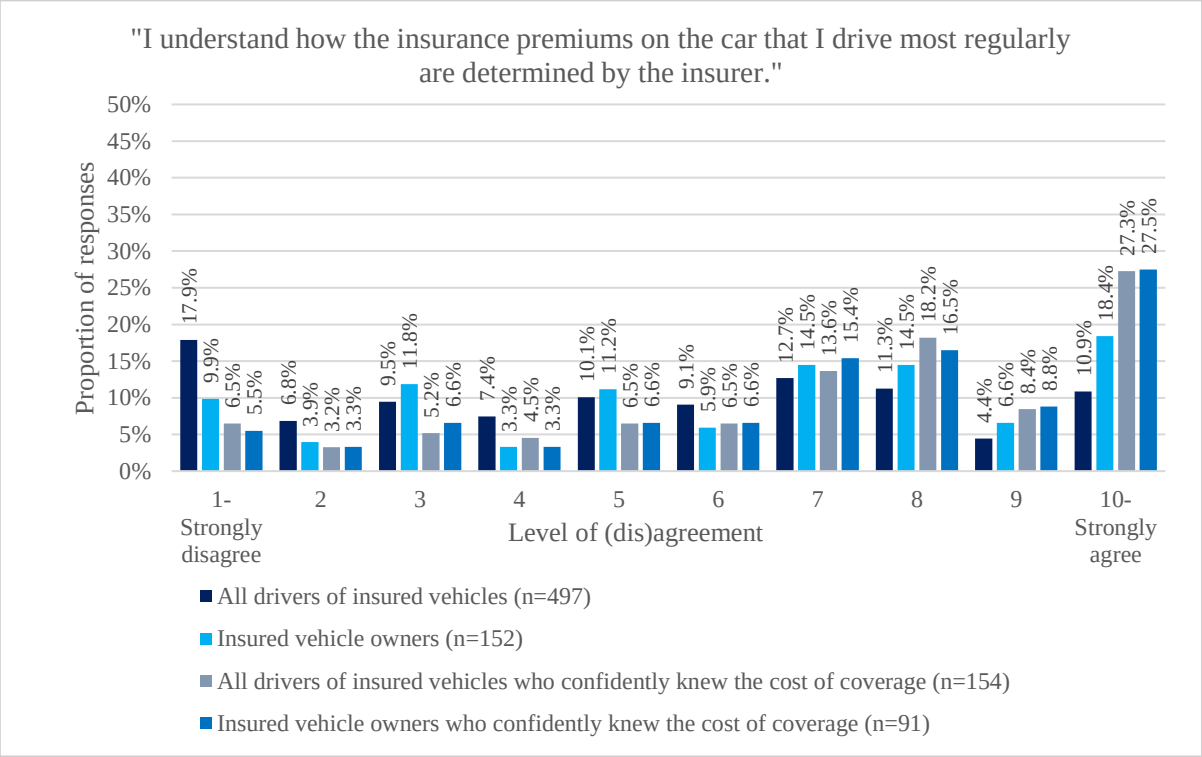

Figure 4.16: Respondents' perceived level of understanding of insurance premium pricing. (Source: Own)

Largely underpinned by the share of the sample that reported relatively poor awareness of the cost of coverage, a considerable cohort of respondents appeared to view the fairness of premiums with relative neutrality, as can be seen in Figure 4.17. Approximately 36.8 percent of insured vehicle owners were inclined to believe that their insurance premiums were relatively unfair. Among respondents with self-reported awareness of the cost of coverage, perceptions of fairness were somewhat positive.

When asked whether respondents believed that their driving ability should beget premium reductions, most responses varied between relatively neutral to strong agreement. As seen in Figure 4.18, this observation was particularly rife among those who indicated surety in their knowledge of the costs of coverage.

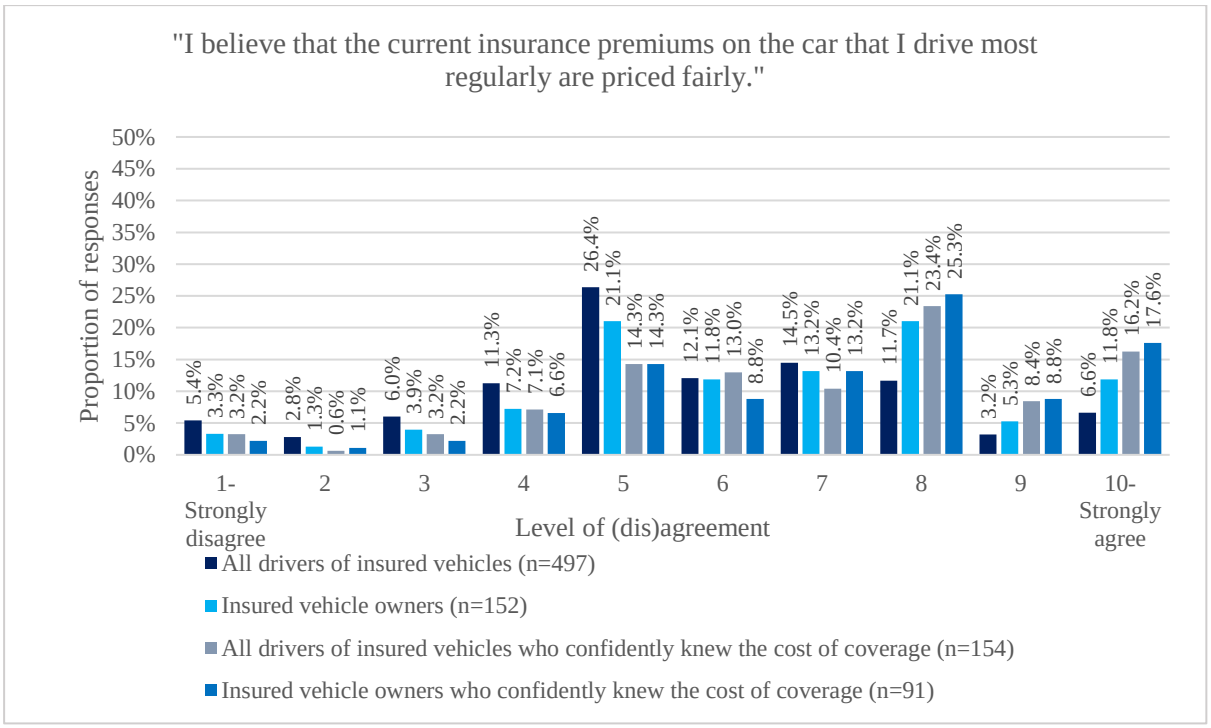

Figure 4.17: Respondents' perceptions of the fairness of current insurance premiums.

(Source: Own)

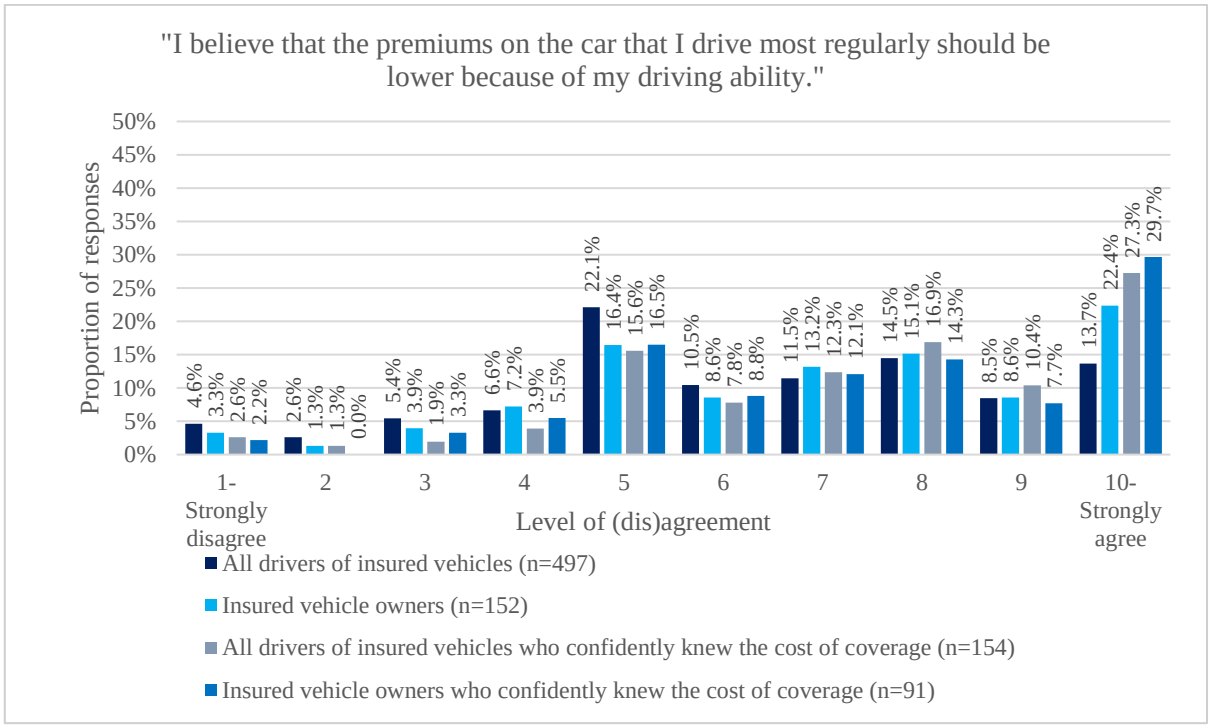

Figure 4.18: Respondents' belief that their driving ability should result in reduced premiums.

(Source: Own)

A clear majority of respondents indicated that they actively consider ways to reduce their travel costs. Because fuel costs arguably represent the most vivid link between vehicle usage and vehicle operating costs, respondents were also asked to indicate whether increases in the cost of fuel typically prompt

them to adjust their VKT. Despite respondents' self-reported price-consciousness relating to travel, most indicated that they do not drive less in response to increases in the price of fuel, perhaps suggesting a degree of inflexibility in their travel requirements and an associated perceived lack of control over this cost component. Relatedly, this result might lead one to believe that the add-ons to the basic fuel price (e.g., the RAF levy) would not necessarily serve as effective price signals for discouraging driving. These results are presented in Figures 4.19 and 4.20.

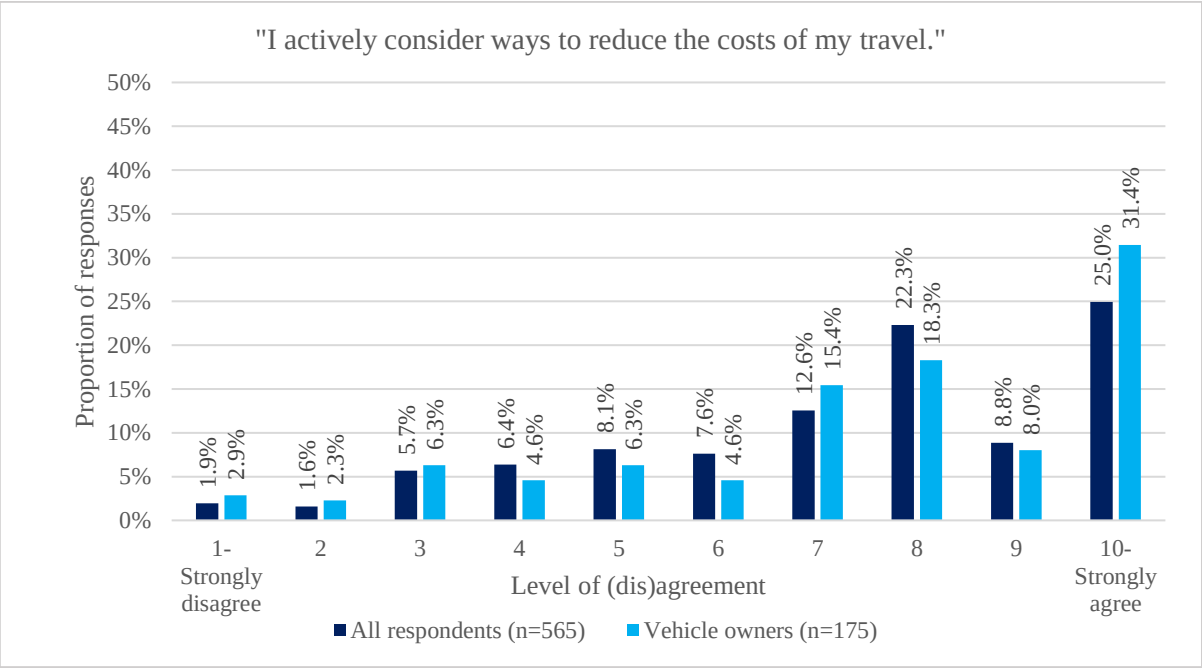

Figure 4.19: Respondents' attempts to reduce their travel costs.

(Source: Own)

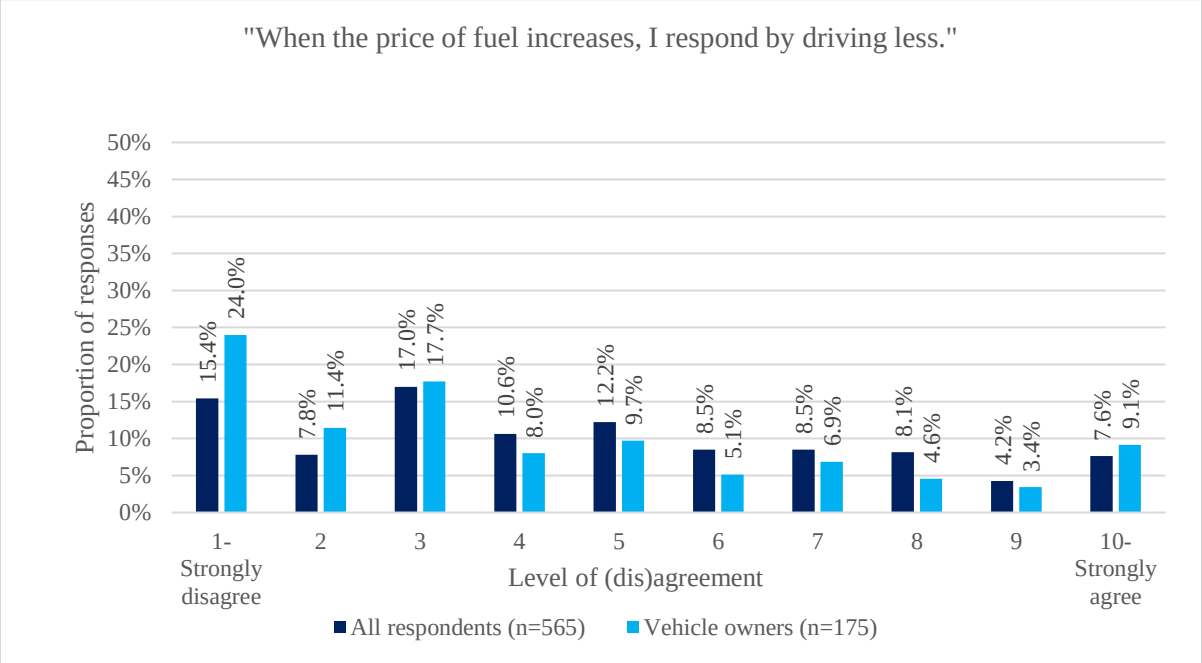

Figure 4.20: Respondents' responsiveness to fuel price increases.

(Source: Own)

The flat-rate bias—a topic re-visited and discussed at length in Section 5.4—leads to an observable tendency among individuals to prefer flat-rate tariffs over variable tariffs, often even in cases where cost savings would be possible under the latter tariff structure. When asked about their inclination towards- or away from variable tariffs that offer long-term savings, 42.1 percent of all respondents showed preference towards flat-rate tariffs, as is illustrated in Figure 4.21. While most respondents did show preference towards the variable tariff, the fact that a share this considerable was inclined towards the tariff option that was clearly labelled as more costly is a case in point of the perceived appeal that flat-rate tariffs appear to hold. This sentiment may be somewhat concerning to UBI providers, especially since it was observed among a cohort of young drivers, who may stand to benefit most from reduced premiums under UBI policies (ceteris paribus).

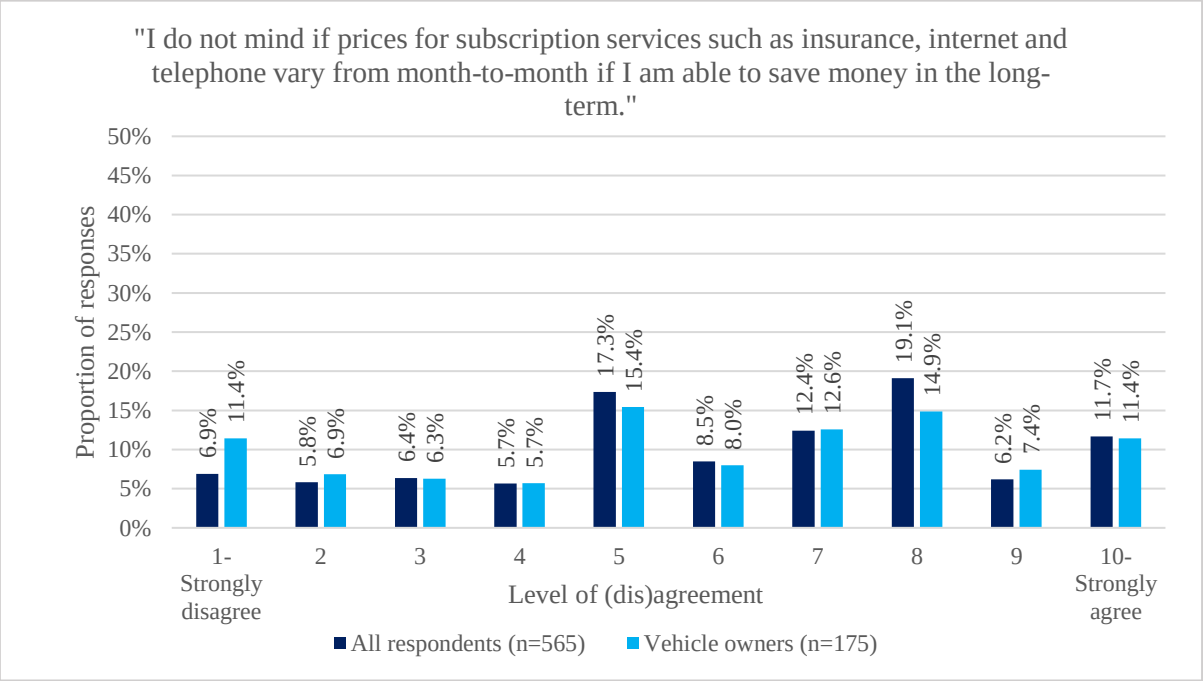

Figure 4.21: Respondents' sentiment towards variable tariff structures.

(Source: Own)

4.2.5 Perceptions of UBI

Just shy of 59 percent of the total sample indicated that they were not aware of the existence of UBI before reading an explanatory statement about this type of policy. Prior knowledge of this type of policy among vehicle owners was similar, with only 45.1 percent of the sub-sample having heard of UBI.

Respondents were asked to indicate their level of interest in subscribing to two types of UBI policies with different levels of driving behaviour monitoring; one in which the insurer only monitors VKT and another in which the insurer monitors both VKT and the manner of driving (including speed, time, location, braking, cornering and cell-phone usage while driving). In both cases, a clear majority of respondents were not opposed to the idea of subscribing. It is worth noting, however, that both types of UBI recorded a modal response of “somewhat interested”—perhaps indicating a degree of hesitance

towards the idea of subscribing. When the responses to the two types of UBI policies were compared, a discernible inclination towards the VKT-only option was apparent. Roughly twice as many respondents indicated that they would either "most likely not-" or "definitely not" consider subscribing to a UBI policy with multiple aspects of driver monitoring when compared to the VKT-only alternative. These differences are visible in Figure 4.22.

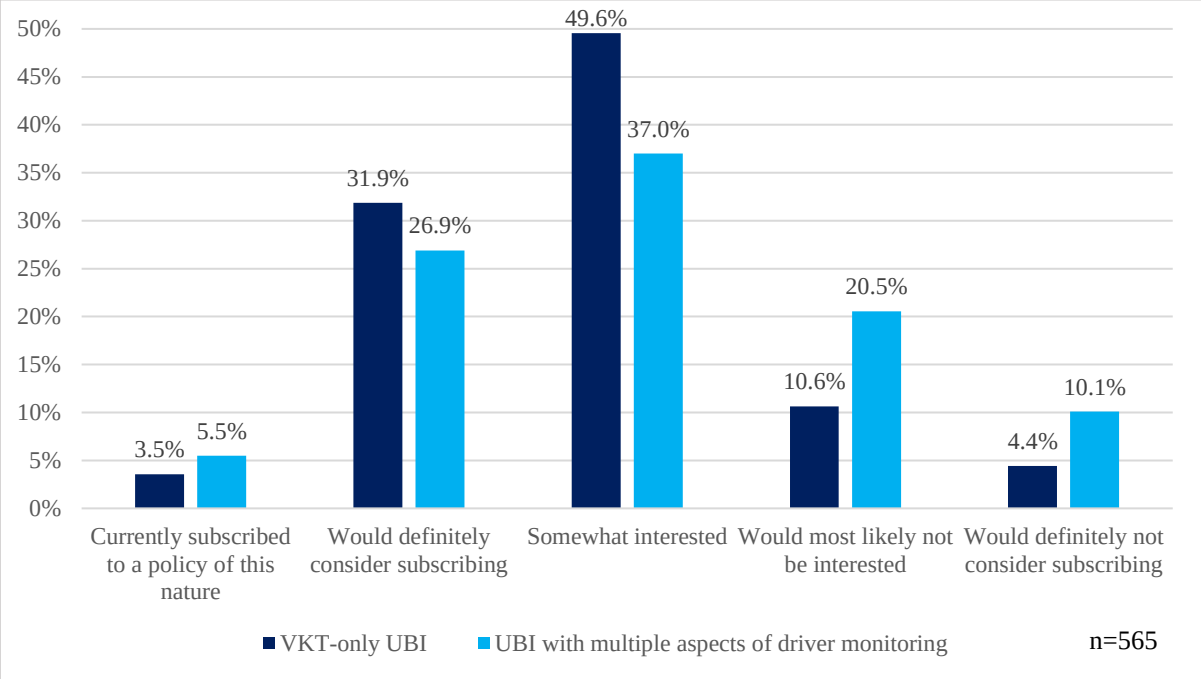

Figure 4.22: Level of interest in usage-based insurance policies among respondents.
(Source: Own)

To gauge respondents' perceptions of the appropriateness of certain behaviour-based rate factors commonly employed by modern UBI providers, respondents were asked to rate the relevance that they believed these aspects had in influencing their driving risk. To this end, a ten-point scale was employed, with 1 representing "Highly irrelevant" and 10 representing "Highly relevant". The aspects considered included *VKT*, *acceleration*, *location*, *time of travel*, *cell-phone usage while driving*, *speed*, *braking* and *cornering*. Based on the mean- and median relevance scores recorded by respondents—presented in Table 4.4—cell-phone usage while driving was perceived to have the largest influence on driving risk. With mean- and median responses of 8.44 and 9.00 respectively, speed was viewed collectively as the second most relevant aspect of those considered. At the opposite end of the ranking, VKT and travel time were perceived with near-neutral relevance. It must be noted, however, that all of the aspects considered were, on average, perceived to be somewhat relevant, as no mean- or median scores of five or below were recorded. In the subsequent section, respondents' perceived comfort levels with having these aspects of their driving behaviour monitored by an insurer are explored.

Table 4.4: Drivers' perceptions of the relevance of certain aspects of driving behaviour in determining their driving risk.

Aspect of driving behaviour	Mean	Median
	1 = Highly irrelevant; 10 = Highly relevant	
Cell-phone usage while driving	9.02	10.00
Speed	8.44	9.00
Cornering	7.63	8.00
Braking	7.42	8.00
Location	7.39	8.00
Acceleration	7.14	7.00
VKT	6.96	7.00
Time of travel	6.66	7.00
n	**565**	

(Source: Own)

When asked what strategies respondents would prioritise most in their efforts to curtail VKT if they were to subscribe to a UBI policy, the modal response was "share lifts more often". Other popular responses involved the use of non-motorised transport (walking and cycling specifically) and simply taking fewer trips. It is worth noting that only 5.8 percent of respondents indicated that they would reduce their VKT by using public transport more often—perhaps adding a further suggestion to its perceived inadequacy as an alternative to private transport. Nearly one-fifth of all respondents indicated that they would not reduce their VKT at all. It is worth noting that fairly similar results were obtained when the respondents that were opposed to UBI (with consideration for multiple aspects of driving behaviour) were excluded. Figure 4.23 illustrates these results.

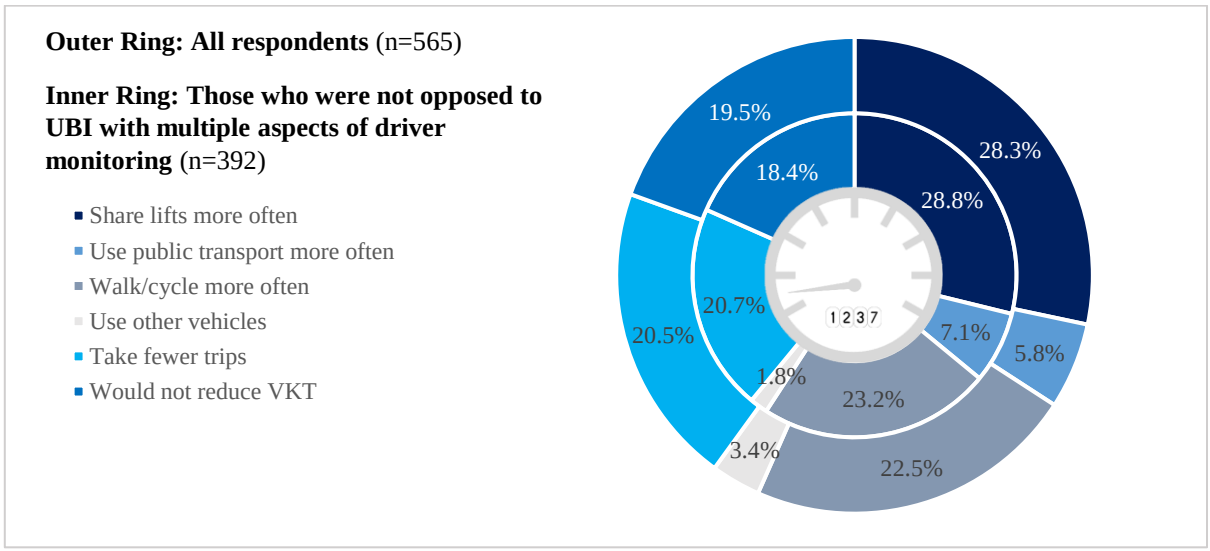

Figure 4.23: Hypothetical strategies prioritised by respondents to curtail VKT.

(Source: Own)

Respondents were asked to rate their level of (dis)agreement with six statements relating to some of the internal- and societal benefits commonly associated with modern UBI policies. These benefits were related to road safety, cost and perceived fairness. As seen in Figure 4.24, most drivers of insured vehicles appeared to believe that UBI policies would deliver cheaper premiums for coverage on the car that they used most regularly. Despite this general inclination towards believing in the potential of UBI policies to engender cost savings, the modal response was five (i.e., a slight inclination towards disagreement with the statement). As such, sentiment towards the potential cost benefits of UBI would appear to be somewhat mixed between neutrality and strong positivity.

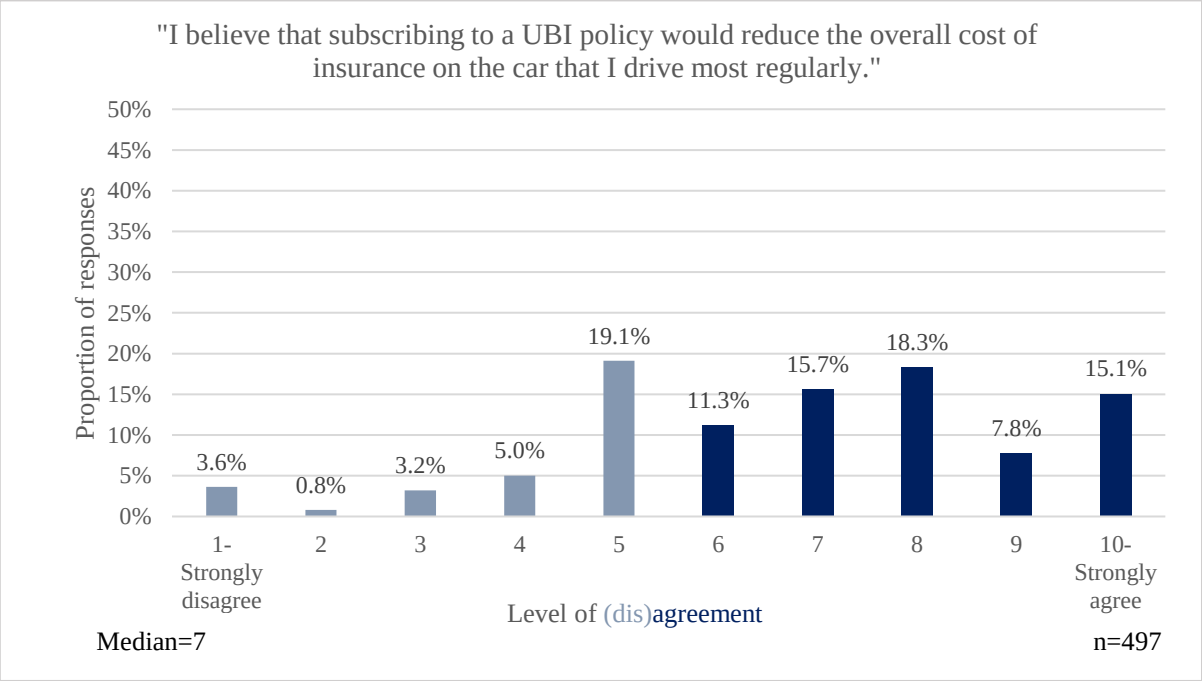

Figure 4.24: Respondents' perceptions of the potential cost benefits of usage-based insurance policies.

(Source: Own)

Illustrated in Figure 4.25—the sample's sentiment towards the potential of UBI policies to encourage VKT curtailment was largely mixed. While a slim majority of insured respondents were inclined to believe that linking premiums to VKT would entice them to drive less, 39.6 percent were inclined to disagree with this sentiment.

The majority of drivers of insured vehicles shared the opinion—mostly with fairly strong conviction—that they would improve their speed limit compliance if the premiums on the car that they used most regularly would be reduced as a result. Marginally more-pronounced results were obtained when all respondents (i.e., insured- and uninsured drivers) were asked to indicate how strongly they believed that *other* road users would improve their speed limit compliance when given the opportunity to achieve premium savings as a result. These collective perceptions are illustrated in Figures 4.26 and 4.27.

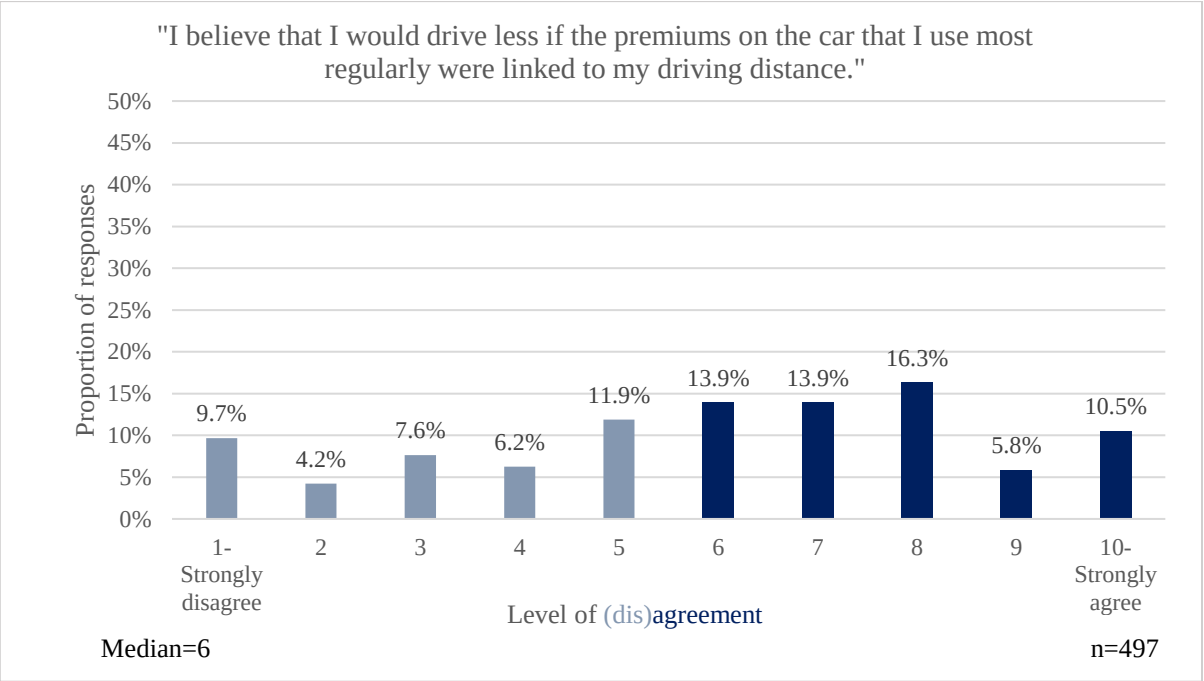

Figure 4.25: Belief among respondents that UBI policies could encourage reductions in their VKT.

(Source: Own)

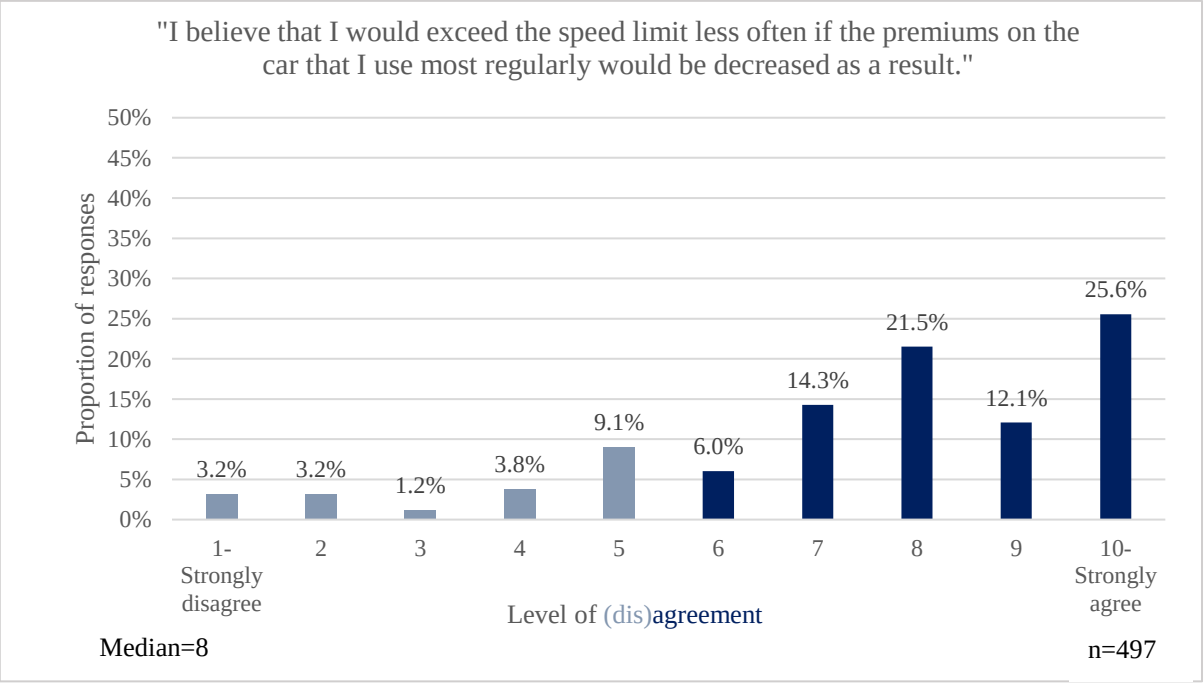

Figure 4.26: Belief among respondents that UBI policies could encourage improvements in their own speed limit compliance.

(Source: Own)

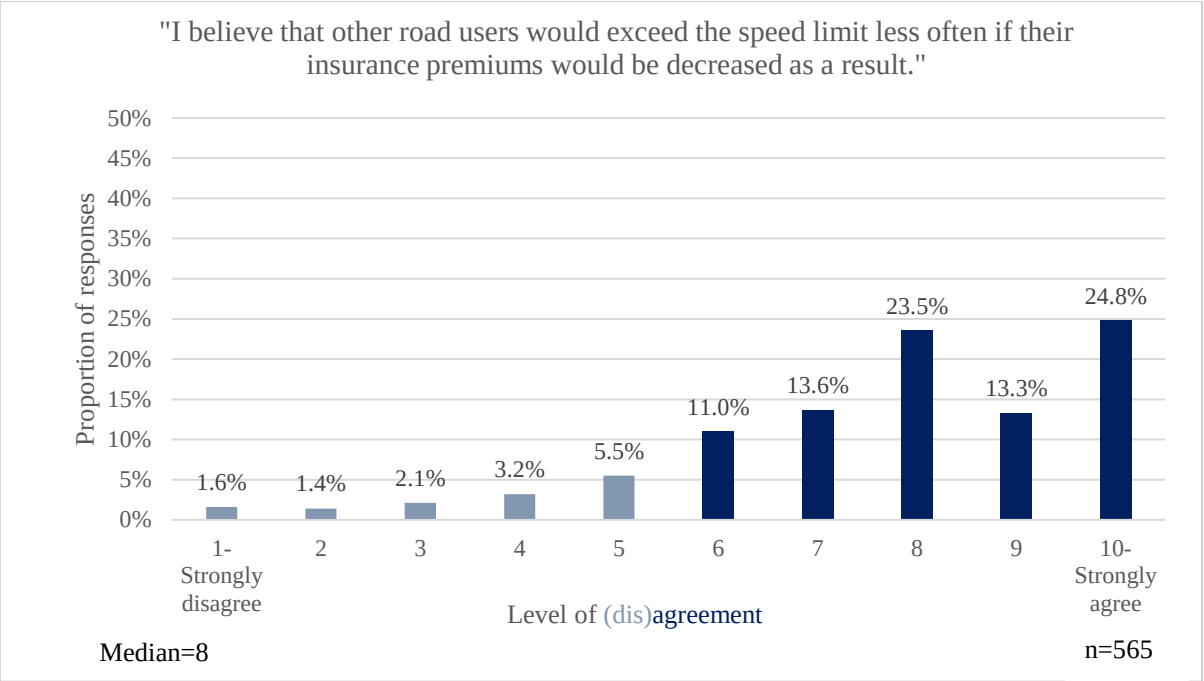

Figure 4.27: Belief among respondents that UBI policies could encourage improvements in the speed limit compliance of others.

(Source: Own)

As illustrated in Figure 4.28, even firmer sentiment was expressed when respondents were asked to indicate how strongly they believed that South African roads would become safer if the driving behaviour of all road users was monitored. Because this question made no suggestion of altered traffic regulations, it could be theorised that this attitude was underpinned by poor perceptions of existing traffic law abidance and enforcement. While the sentiment observed would bode well for UBI providers, whether drivers would accept this level of intrusion remains uncertain.

In general, most respondents appeared to support the notion that UBI policies hold an advantage over traditional insurance policies from a fairness viewpoint. Just under one-fifth of the group was, however, inclined to disagree with this viewpoint, as can be seen in Figure 4.29.

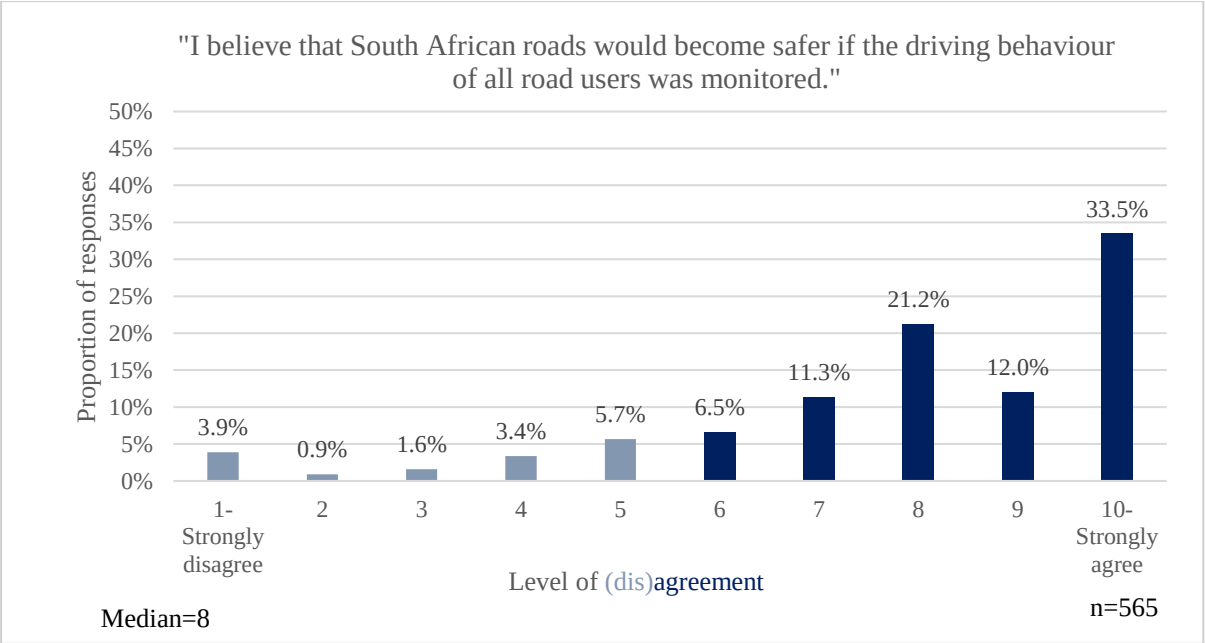

Figure 4.28: Belief among respondents that driving behaviour monitoring could engender improved road safety outcomes in South Africa.

(Source: Own)

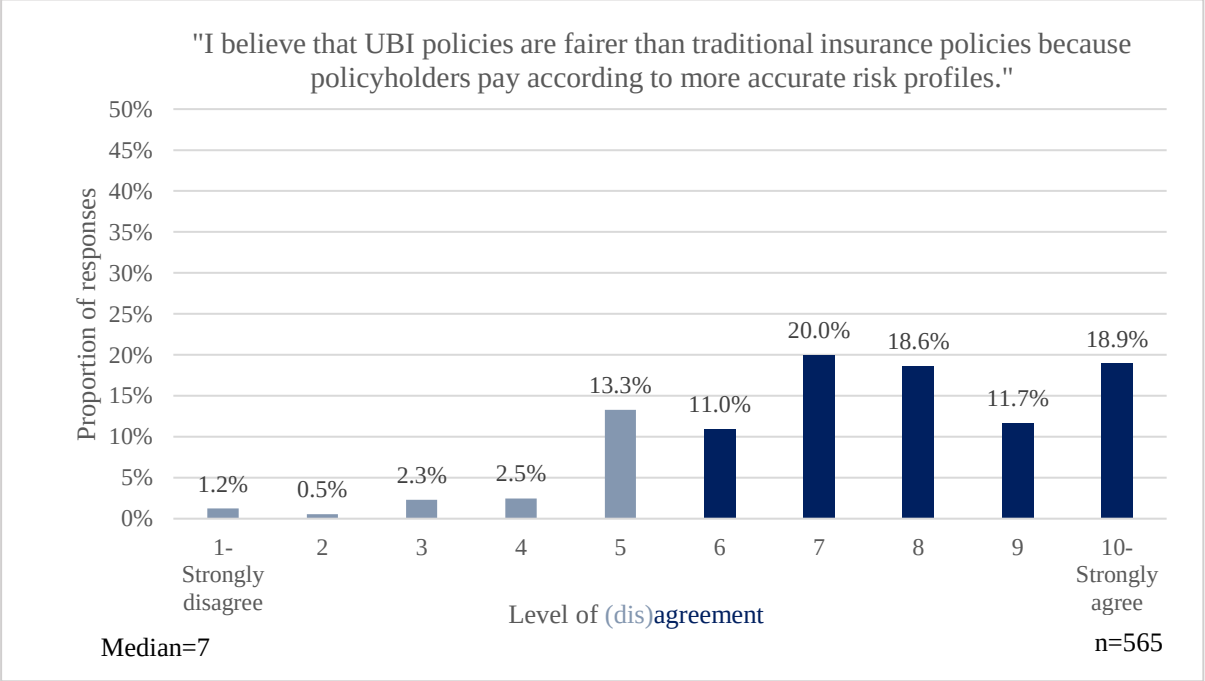

Figure 4.29: Respondents' sentiment towards the fairness of UBI policies.

(Source: Own)

4.2.6 Digital Readiness and Acceptance

Smartphone proliferation was near-ubiquitous among the sample. Of the 565 respondents, 561 owned a smartphone, while only three indicated that they did not. The remaining respondent was unsure whether the cell-phone that they owned was a smartphone.

Among those who did have a smartphone, approximately 98.2 percent of respondents knew how to toggle their device's location settings between on and off, and 99.6 percent confirmed their ability to download- and update applications. High levels of smartphone proliferation and the ability to perform these core tasks suggested that most of the sample would be able to use a mobile application-based UBI offering.

Participants were asked whether the insurer that provides coverage for the car that they used most regularly had a smartphone application. Figure 4.30 breaks down the responses obtained from the 152 insured vehicle owners. Among insured vehicle owners who were aware that their insurer did have a smartphone application, only approximately 55.7 percent indicated that they used the application.

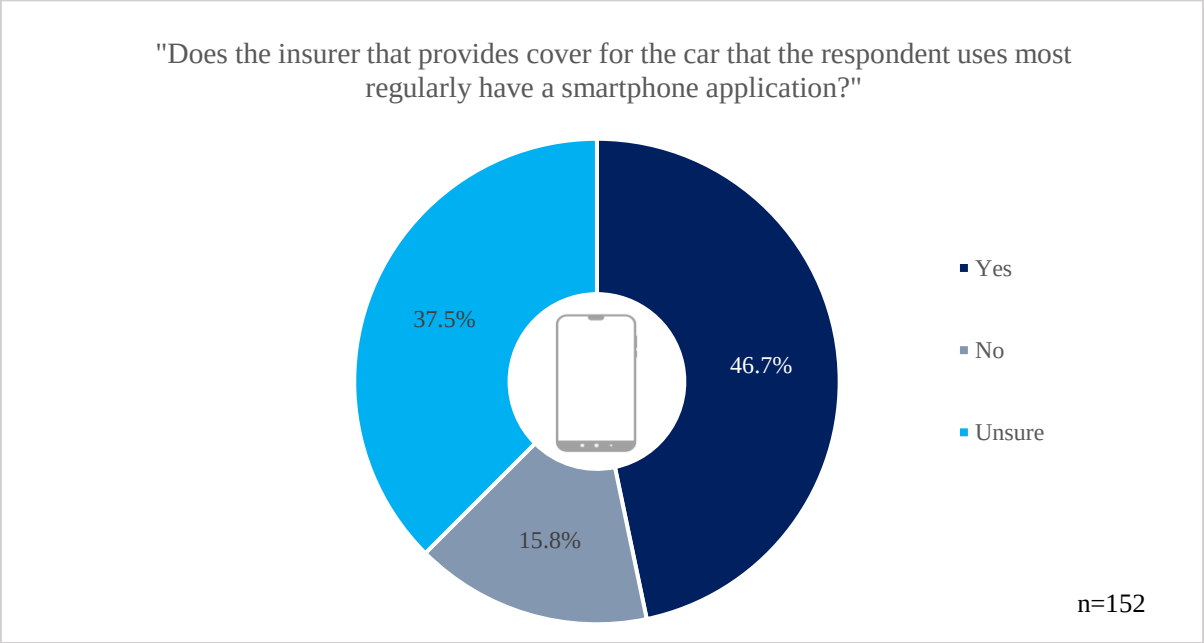

Figure 4.30: Insured vehicle owners' awareness of insurers' smartphone applications.
(Source: Own)

Because it was anticipated that usage of insurers' smartphone applications may be low among the sample, given the large share of young drivers who would most regularly use a car owned by someone else, it was decided to include questions relating to mobile banking solutions as a means to gauge respondents' comfort with using digital channels in the financial services sector. With 94.9 percent of respondents indicating that they used either a smartphone or computer for personal banking, the use of digital banking solutions was near-universal, perhaps suggesting both an ability- and a willingness to use digital channels for transactions in the financial services sector. When asked to rate the level of confidence that they felt when completing banking transactions using these digital channels, approximately 85.3 percent of respondents selected either 8, 9 or 10 (out of 10), while only 4.7 percent of respondents showed a definitive inclination towards uncertainty (i.e., selected 1-5). These pronounced results are presented in Figure 4.31.

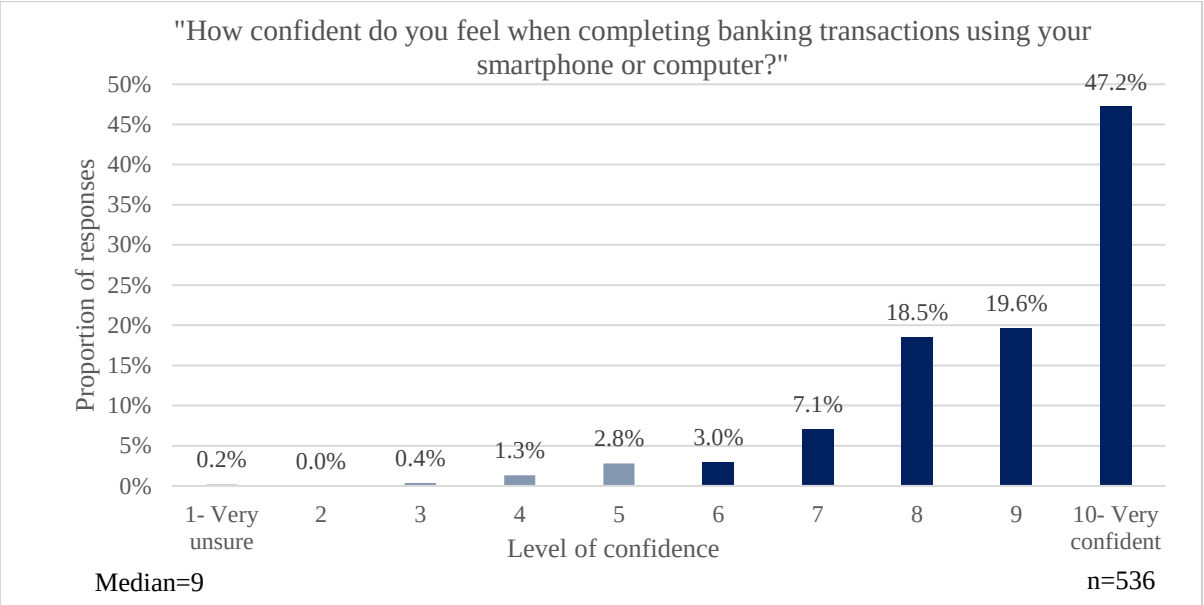

Figure 4.31: Respondents' level of confidence when completing banking transactions using digital channels.

(Source: Own)

In addition to questions relating to the financial services sector, respondents' level of comfort relating to non-specific online purchases was gauged. To this end, participants were asked to rate their level of agreement with the statement "I feel confident when making purchases online or via smartphone applications." Approximately 60.5 percent of the sample selected 8, 9 or 10, while only 16.6 percent of respondents were inclined to disagree with the statement. While these observations—illustrated in Figure 4.32—are less clear-cut than those relating to the financial services sector, they still suggest that the bulk of the sample did not find the use of digital channels to be prohibitively uncomfortable.

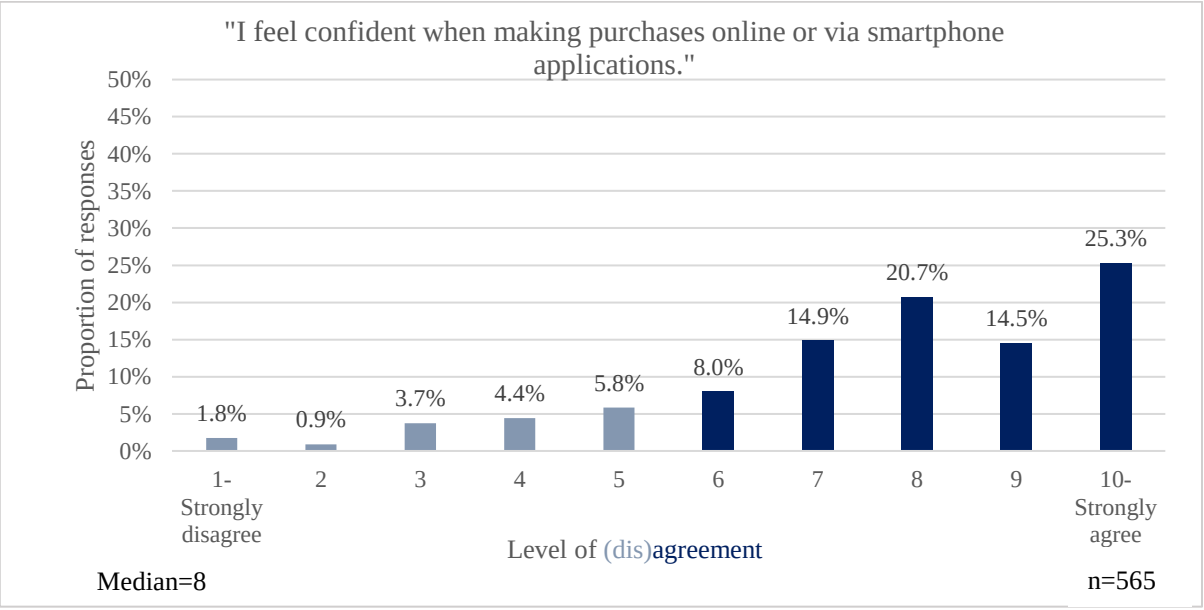

Figure 4.32: Respondents' level of confidence when making purchases using digital channels.

(Source: Own)

Respondents were asked to indicate whether they would prefer to have their driving behaviour monitored for insurance purposes using a smartphone application or a dedicated device that would stay in their car permanently. With more than two-thirds of all respondents opting for the permanent device—illustrated in Figure 4.33—a pronounced preference towards this method of monitoring emerged. Among respondents who were not opposed to the idea of subscribing to a UBI policy with consideration for multiple aspects of behaviour monitoring, notably similar results were observed. While the sub-sample was admittedly small, similar results were even observed among vehicle owners who indicated that they already used their insurers' smartphone applications. This may present a quandary for insurers, as smartphone-based behaviour monitoring has the potential to achieve significant cost advantages[31].

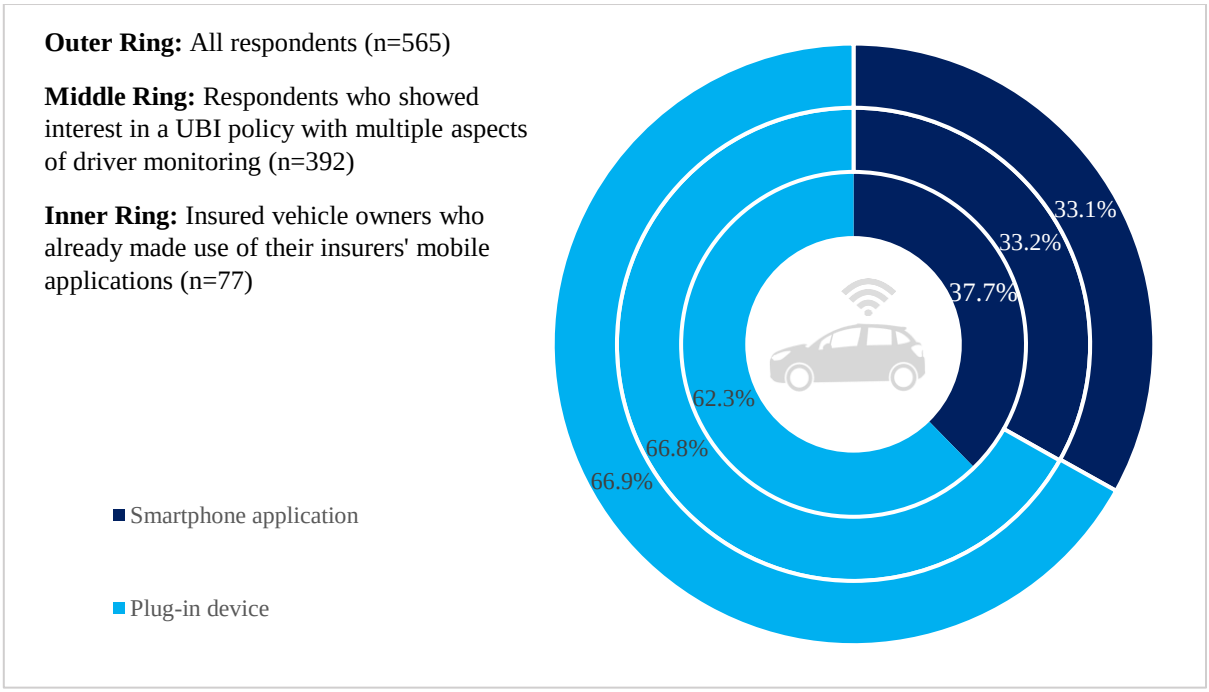

Figure 4.33: Respondents' preferred means of driving behaviour monitoring.
(Source: Own)

Although most respondents appeared to use smartphones competently, the sentiment towards mobile applications that monitor their users' location was largely unfavourable. Only 30.8 percent of the sample was inclined to disagree with this view, perhaps suggesting that the use of mobile devices to integrate location- and VKT data into rate-making may impede some UBI providers' efforts to garner consumer support. This result may, however, be somewhat exaggerated, as respondents could have assumed that

[31] Smartphone-based behaviour monitoring requires policyholders to make use of their own devices and, in doing so, avoids the incurrence of hardware costs for insurers. Similarly, the resources (relating to both monetary costs and time) associated with the delivery- and installation of plug-in devices would be avoided. Because of the variable nature of these avoided hardware costs, it is likely that the potential savings for insurers would inflate as the customer base grows.

the survey referred specifically to smartphone applications that monitor their users' location unknowingly. These results can be seen in Figure 4.34.

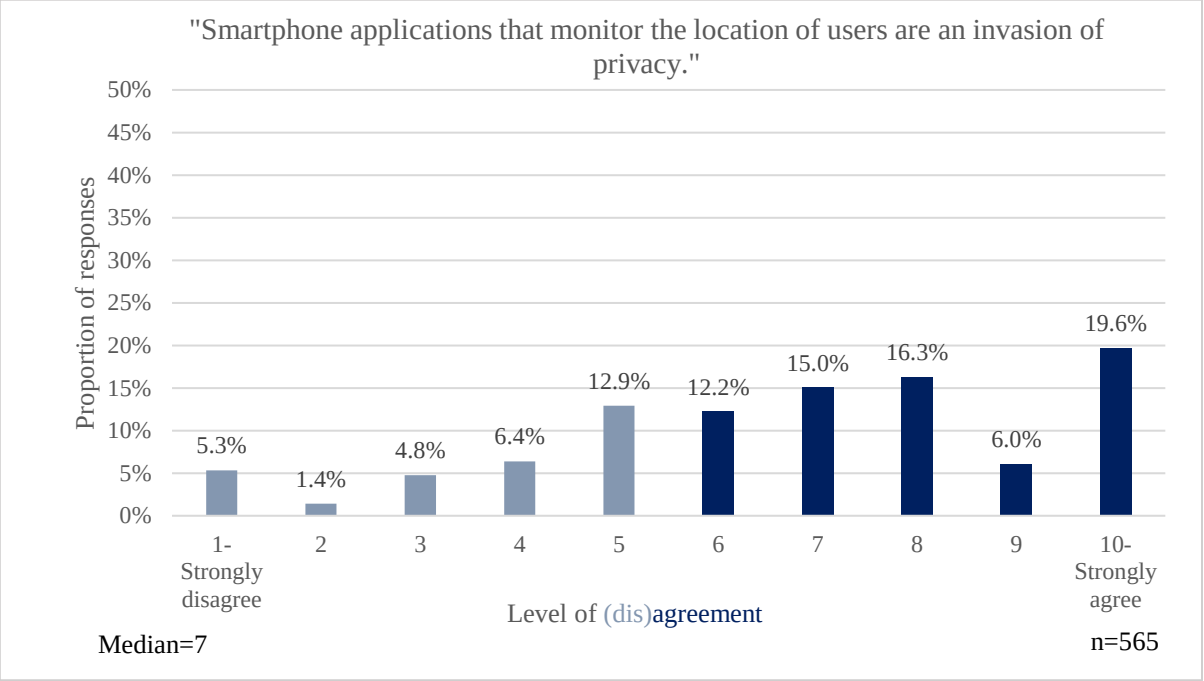

Figure 4.34: Respondents' sentiment towards mobile applications that monitor users' location. (Source: Own)

In an attempt to reveal potential concerns among drivers relating to behaviour monitoring, respondents were asked to indicate their level of (dis)comfort with having certain aspects of their driving monitored by an insurer. The aspects considered included *VKT*, *acceleration*, *location*, *time of travel*, *cell-phone usage while driving*, *speed*, *braking* and *cornering*. As mentioned throughout the thesis, these aspects of driving behaviour have all been adopted by modern UBI providers in their rate-making processes (although not necessarily collectively). As can be seen in Table 4.5, which provides basic descriptive statistics relating to the responses obtained, the mean scores for all but two aspects of driving behaviour were notably similar. Based on the mean- and median scores, respondents appeared to be particularly comfortable with having their VKT monitored by insurers, while some degree of hesitance was shown towards location monitoring. The fact that most respondents exhibited receptivity towards VKT monitoring bodes well for UBI providers, however, the use of location data as a means to derive VKT would appear to cause apprehension among drivers towards some UBI offerings. Similar opposition would likely be felt by UBI providers that use driving location itself as a rate factor (as opposed to using location as a source from which to derive VKT).

Table 4.5: Drivers' (dis)comfort level with having certain aspects of their driving behaviour monitored by an insurer.

Aspect of driving behaviour	Comfort Scores (1 = Very uncomfortable; 10 = Very comfortable)	
	Mean	**Median**
VKT	8.27	9.00
Speed	7.44	8.00
Cell-phone usage while driving	7.43	8.00
Cornering	7.41	8.00
Braking	7.30	8.00
Time of travel	7.26	8.00
Acceleration	7.25	8.00
Location	6.02	7.00
n	**565**	

(Source: Own)

To illustrate opinions relating to both the relative- *comfort* and *relevance* that respondents attached to having these aspects of revealed driving behaviour used for insurance purposes, the sample's mean ratings of comfort and relevance were placed on a two-dimensional plane—seen in Figure 4.35. In this figure, the coordinates of each attribute were determined by their mean comfort- and relevance scores, as obtained from the entire sample. The cross-section was placed based on the grand means of the relevance- and comfort scores for all attributes.

Based on this illustrative analysis, it might be argued that consumers are likely to be relatively amenable towards the aspects that occupied the upper right-hand quadrant. Conversely, *location*—located firmly in the bottom left-hand quadrant—is likely to face greater apprehension, as consumers typically had a relatively poor understanding of why this aspect of behaviour should be monitored and felt less comfortable with this prospect.

Despite VKT being viewed as the second least relevant of the aspects considered, respondents collectively appeared relatively amenable to the prospect of having this aspect of behaviour monitored. As such, insurers with UBI offerings should seek to clarify the justification for this aspect of behaviour monitoring.

While this illustration has intuitive appeal, it is unlikely that feelings of discomfort or irrelevance are the only sources of potential consumer apprehension towards behaviour monitoring. Similarly, it might

be posited that discomfort towards a particular aspect of behaviour monitoring could erode consumer amenability to a greater extent than feelings of irrelevance towards the same aspect.

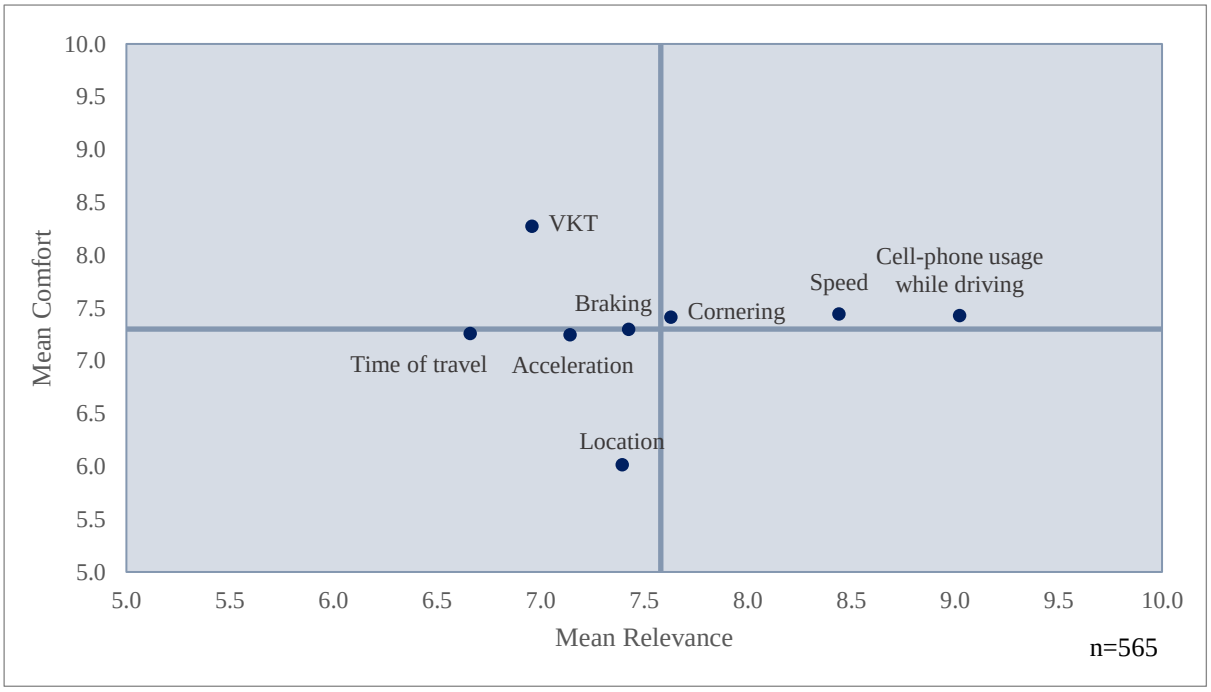

Figure 4.35: Illustrative relevance-comfort matrix relating to respondents' attitudes towards driving behaviour monitoring for insurance purposes.

(Source: Own)

4.3 Statistical Analyses Relating to Level of Interest in Usage-Based Insurance Policies

In this section of the chapter, attention turns to the results of the tests used to establish whether statistically significant differences existed between the characteristics of- and sentiment expressed by those dubbed Forerunners, Non-Partisans and Laggards (based on their level of interest in a UBI policy that includes consideration for multiple aspects of driving behaviour).

A total of 39 Kruskal-Wallis omnibus tests were conducted to establish whether sentiment differed between the sub-groups. Of these 39 tests, 27 yielded statistically significant results at the five percent significance level. As such, 81 post-hoc Dunn-Bonferroni pairwise comparisons were carried out[32]. Despite the Bonferroni correction's conservative nature, a total of 55 of these pairwise comparisons yielded statistically significant results. Perhaps expectedly, the largest number of significant differences were identified between the sub-groups with firmer stances on whether they would consider subscribing to a UBI policy (i.e., Forerunners and Laggards). On 23 out of 27 possible occasions, Forerunners and Laggards differed significantly in their responses to the statements/questions posed. Particularly

[32] Three pairwise comparisons per statistically significant omnibus test.

polarising differences between these groups emerged in the sections of the survey relating to *perceptions of UBI* and *digital readiness and acceptance*. In 18 instances, significant differences were identified between the responses obtained from Forerunners and Non-Partisans. With significant differences identified on only 14 occasions, almost half of the pairwise comparisons between Non-Partisans and Laggards, however, yielded results that favoured the null hypotheses of the Dunn-Bonferroni tests—highlighting the somewhat-mixed sentiment expressed by Non-Partisans. In ten of the statements/questions posed, significant differences in responses were identified in each of the three pairwise comparisons. The results of these analyses are presented in Tables 4.6 through 4.15 and Figures 4.36 through 4.42. In these tables, statistical significance (at the five percent level) is indicated by blue shading.

Out of the 14 Chi-square tests used to identify the existence of significant associations between categorical variables that related to respondents' characteristics and their level of interest in UBI, all but four yielded no evidence of association at the five percent significance level. The four variables with significant- but weak associations related to employment status, annual VKT, current insurance status and prior knowledge of the existence of UBI[33].

This section of the chapter contains six sub-sections—one for each of the six categories of questions contained in the survey.

4.3.1 Respondent Characteristics

Because the sample included a large share of relatively young drivers who were not necessarily vehicle owners themselves, it was of interest to the researcher whether the youngest respondents' level of interest in UBI would diverge sharply from that of their older counterparts. To this end, the level of interest of respondents who were aged 22 or younger (i.e., those who had a driving licence for a maximum of four years and 364 days) was compared to that of all other respondents. Perhaps expectedly—since only drivers aged 34 and below were included in the survey—this crosstabulation yielded no significant association between the variables in question, χ^2 (2, N=565) = 0.45, p = 0.80. It is, however, advised that future studies of a similar nature with greater age dispersion include age-based comparisons across levels of interest.

Because the sample included a large share of respondents who themselves did not own the vehicle that they used most regularly, testing was undertaken to compare vehicle owners' level of interest in UBI to that of non-vehicle owners. No significant association arose from this comparison, χ^2 (2, N=565) = 1.23, p = 0.54.

Among respondents who identified as either male or female, at the five percent level of significance, no relationship emerged between gender and level of interest in UBI, χ^2 (2, N=562) = 5.23, p = 0.07. If the

[33] The results of the Chi-square tests can be found in tabular form in Appendix G.

acceptable significance level were increased to ten percent, it would have appeared that females were generally more amenable towards UBI, while a greater proportion of males were grouped as Laggards.

The type of municipality in which respondents lived (i.e., metropolitan or local) had no significant association with their level of interest in UBI, χ^2 (2, N=565) = 0.60, p = 0.74.

One might have expected those with access to multiple cars to show greater interest in UBI as they would potentially stand to benefit from cheaper coverage for their relatively low-VKT vehicles. This hypothesis could not be confirmed as no association was found between whether the respondent had access to a single car or multiple cars and their corresponding level of interest in UBI, χ^2 (2, N=565) = 0.66, p = 0.72. One might, however, hypothesise that related analyses that consider only those who *owned* (as opposed to *had access to*) multiple vehicles may yield different results, particularly if their usage of the vehicles is unbalanced.

A significant- but weak[34] association was observed between whether a respondent held some form of employment and their level of interest in UBI, χ^2 (2, N=565) = 7.30, p = 0.03, V = 0.11. A greater proportion of respondents who did not hold any form of employment were Non-Partisans than Forerunners.

4.3.2 General Travel Behaviour

In general, the three groups did not show marked differences in their responses to statements relating to general travel behaviour. Only one out of the five statements—relating to enjoyment while driving—produced significant differences in the Kruskal-Wallis omnibus test. When pairwise comparisons were carried out using the conservative Dunn-Bonferroni test, the only statistically significant difference identified was between Non-Partisans and Laggards—a result largely underpinned by greater dispersion in the sentiment expressed by Non-Partisans.

Table 4.6: Results of Kruskal-Wallis Tests for statements relating to general travel behaviour.

Statement	N	Test statistic	Degrees of Freedom	Asymptotic Sig. (2-sided)
My travel patterns remain close to constant each week.	565	2.26	2	0.32
I don't like to rely on others for lifts.	565	3.83	2	0.15
I enjoy driving.	565	7.30	2	0.03
I enjoy the flexibility that having access to a car provides.	565	5.47	2	0.06
I believe that I am a better-than-average driver.	565	2.96	2	0.23

(Source: Own)

[34] Cramer's V was used to measure the strength of association between variables.

Table 4.7: Pairwise comparisons between Forerunners, Non-Partisans and Laggards for statements relating to general travel behaviour.

Statement	Forerunner—Non-Partisan		Non-Partisan—Laggard		Forerunner—Laggard	
	Test statistic	Adjusted Sig.	Test statistic	Adjusted Sig.	Test statistic	Adjusted Sig.
I enjoy driving.	20.72	0.60	-44.21	0.02	-23.49	0.49

(Source: Own)

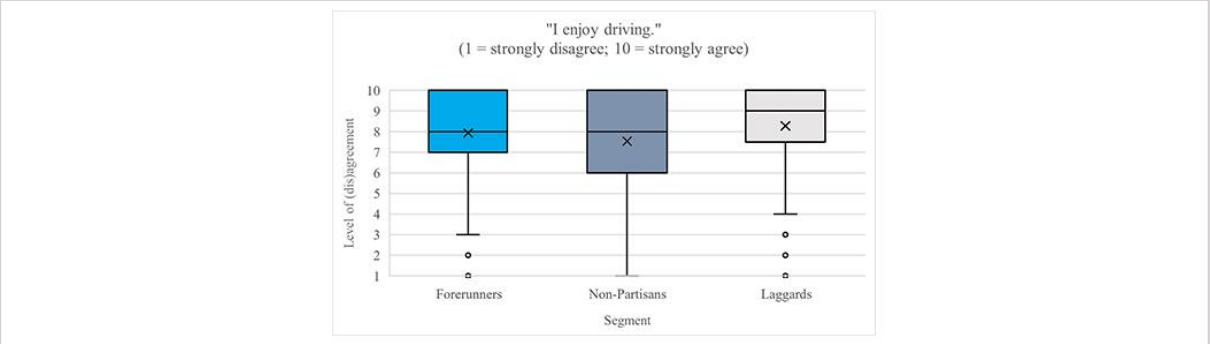

Figure 4.36: Visualised results of Kruskal-Wallis Tests for statements relating to general travel behaviour.

(Source: Own)

Because of the link between VKT and insurance premiums under UBI schemes, one might expect UBI providers to garner limited support from relatively high-VKT drivers. Respondents who indicated that they typically drove more than 20,000 kilometres per year (prior to the outbreak of COVID-19) were significantly more likely to be Laggards than Forerunners, χ^2 (2, N=565) = 8.32, p = 0.02, V=0.12. Although the Cramer's V value obtained was indicative of a fairly weak relationship, one should take heed that the sub-groups were defined based on their levels of interest in subscribing to a UBI policy that included consideration for multiple aspects of driving behaviour (i.e., not only VKT).

4.3.3 Perceptions of Public Transport

Significant differences were identified between the groups in their willingness to use a much-improved public transport system as both a supplement to- and a substitute for private car use. In general, Forerunners were more open to the idea of increasing their use of public transport than Laggards. Forerunners and Non-Partisans both typically displayed a greater willingness to use public transport as a substitute for private vehicle use than Laggards, however, all three groups did display a large degree of dispersion in their responses to this statement—seen in Figure 4.37.

Table 4.8: Results of Kruskal-Wallis Tests for statements relating to perceptions of public transport.

Statement	N	Test statistic	Degrees of Freedom	Asymptotic Sig. (2-sided)
If the quality of public transport in my area were to improve considerably, I would consider using public transport more often.	565	11.12	2	0.00
If the quality of public transport were to improve considerably, I would consider not using a car anymore.	565	18.28	2	0.00

(Source: Own)

Table 4.9: Pairwise comparisons between Forerunners, Non-Partisans and Laggards for statements relating to perceptions of public transport.

Statement	Forerunner—Non-Partisan		Non-Partisan—Laggard		Forerunner—Laggard	
	Test statistic	Adjusted Sig.	Test statistic	Adjusted Sig.	Test statistic	Adjusted Sig.
If the quality of public transport in my area were to improve considerably, I would consider using public transport more often.	25.93	0.33	30.73	0.19	56.66	0.00
If the quality of public transport were to improve considerably, I would consider not using a car anymore.	5.20	1.00	60.63	0.00	65.83	0.00

(Source: Own)

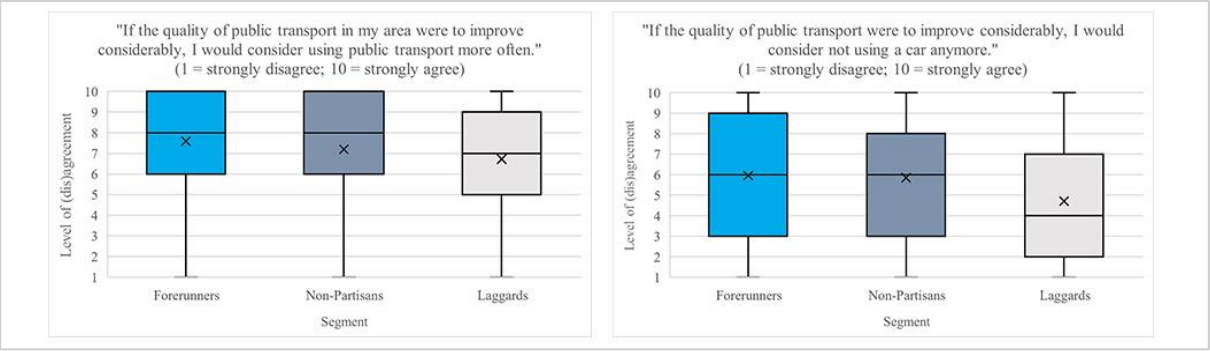

Figure 4.37: Visualised results of Kruskal-Wallis Tests for statements relating to perceptions of public transport.

(Source: Own)

4.3.4 Insurance Status and Price Considerations

When presented with statements relating to cost considerations, the groups generally did not differ in their responses. This could perhaps be explained by the generally-poor levels of cost awareness and largely mixed results encountered in this section of the survey. Forerunners did, however, display greater

consideration for the costs associated with travel than Laggards—suggesting a greater degree of price consciousness among the former group. Because it was thought that clearer results might have emerged in this category of statements among vehicle owners, the tests were repeated with only these respondents included. While this did admittedly limit the sample sizes utilised, similar results were ultimately obtained in all of the omnibus tests.

Table 4.10: Results of Kruskal-Wallis Tests for statements relating to price considerations.

Statement	N	Test statistic	Degrees of Freedom	Asymptotic Sig. (2-sided)
I know the exact cost of the insurance premiums on the car that I drive most regularly.	497	1.973	2	0.373
I understand how the insurance premiums on the car that I drive most regularly are determined by the insurer.	497	2.881	2	0.237
I believe that the current insurance premiums on the car that I drive most regularly are priced fairly.	497	3.699	2	0.157
I believe that the premiums on the car that I drive most regularly should be lower because of my driving ability.	497	5.158	2	0.076
I actively consider ways to reduce the costs of my travel.	565	10.915	2	0.004
When the price of fuel increases, I respond by driving less.	565	0.481	2	0.786
I do not mind if prices for subscription services such as insurance, internet and telephone vary from month-to-month if I am able to save money in the long-term.	565	4.971	2	0.083

(Source: Own)

Table 4.11: Pairwise comparisons between Forerunners, Non-Partisans and Laggards for statements relating to price considerations.

Statement	Forerunner—Non-Partisan		Non-Partisan—Laggard		Forerunner—Laggard	
	Test statistic	Adjusted Sig.	Test statistic	Adjusted Sig.	Test statistic	Adjusted Sig.
I actively consider ways to reduce the costs of my travel.	30.747	0.176	25.399	0.372	56.146	0.003

(Source: Own)

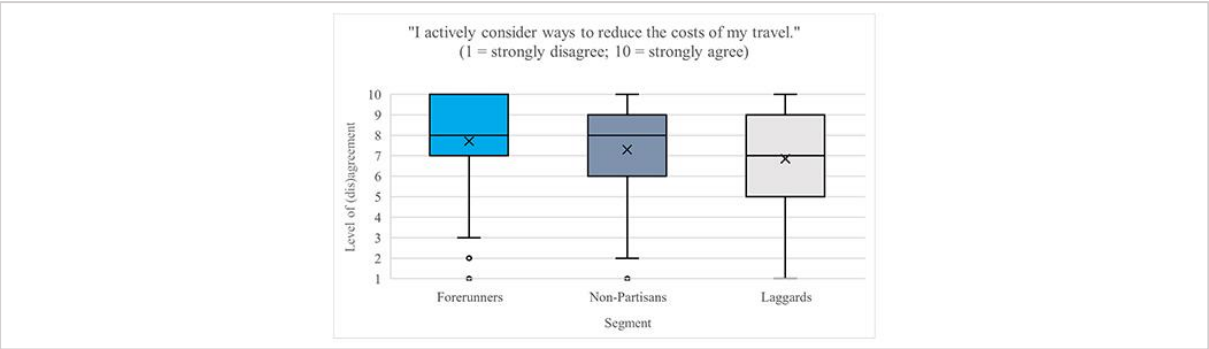

Figure 4.38: Visualised results of Kruskal-Wallis Tests for statements relating to insurance status and price considerations.

(Source: Own)

A statistically significant- but weak relationship was identified between current vehicle insurance status and level of interest in UBI, χ^2 (4, N=565) = 16.39, p = 0.003, V=0.12. A smaller share of Non-Partisans drove vehicles most regularly that were insured than both Forerunners and Laggards. Additionally, a greater proportion of Non-Partisans were unsure whether the vehicle that they used most regularly was insured than Forerunners.

Among drivers of insured vehicles, no statistically significant relationship was identified between whether respondents were responsible for making insurance decisions relating to the car that they used most regularly and their corresponding level of interest in UBI, χ^2 (2, N=497) = 2.39, p = 0.26.

Among drivers of insured vehicles who knew what type of coverage the vehicle that they used most regularly had, no statistically significant relationship was identified between the type of policy that covered the car that the respondent used most regularly and their level of interest in UBI, χ^2 (4, N=356) = 3.18, p = 0.53. This result was not particularly surprising, as no indication was given of whether the UBI policy in question would provide comprehensive- or third-party coverage.

In the group comprised of insured respondents who were responsible for making insurance decisions relating to the car that they used most regularly, no statistically significant relationship was identified between whether respondents would be willing to change their insurance policy to achieve premium savings and their corresponding level of interest in UBI, χ^2 (2, N=95) = 2.10, p = 0.35. One might have expected those who had shown greater price sensitivity to show greater interest in UBI owing to the potential for further cost savings. It might be this limited group of respondents simply did not associate UBI with cost savings. Further discussion relating to the potential of UBI to deliver cost savings is included in the subsequent section.

4.3.5 Perceptions of Usage-Based Insurance

Noteworthy differences were observed between the groups when statements/questions relating to respondents' perceptions of UBI were posed. In this section, the Kruskal-Wallis omnibus tests recorded

positive differences between the distributions of groups' responses in all but two statements. In both of these cases, increasing the accepted level of significance to ten percent would have yielded positive results.

Forerunners viewed the aspects of driving behaviour often considered by modern UBI providers to be more relevant in influencing risk exposure than Laggards in all but two cases (namely *VKT* and *location of travel*). Non-Partisans generally saw greater relevance in the *rate of acceleration*, *driving speed* and *sharpness of braking* than Laggards, while *Driving speed* and *cell-phone use while driving* were generally considered to have less influence on risk exposure among Non-Partisans than Forerunners. These differences in the distributions of responses do not necessarily indicate that Laggards typically considered behaviour monitoring to be irrelevant. In general, most respondents did view behaviour monitoring to be at least somewhat relevant, as seen in Figure 4.39.

When respondents were asked to indicate their sentiment towards various benefits commonly ascribed to UBI policies, fairly pronounced results were obtained. Forerunners generally showed stronger belief in the ability of UBI to deliver cost savings, encourage greater speed limit compliance (for both themselves and other drivers) and improve general road safety than both Non-Partisans and Laggards. When compared to the other groups, Forerunners also considered the fairness of UBI particularly favourably. Non-Partisans generally displayed greater belief in the ability of UBI policies to deliver cost savings and typically viewed the fairness of these policies more favourably than Laggards.

The lack of statistical significance in the post hoc test relating to the belief among respondents that UBI policies could encourage VKT curtailment highlighted the sample's mixed sentiment towards this outcome being realised[35].

In addition to the differences in sentiment outlined above, a weak statistically significant association was identified between whether respondents had prior awareness of the existence of UBI and their associated level of interest in UBI, χ^2 (2, N=565) = 9.28, p = 0.01, V=0.13. Non-Partisans were marginally more likely to have not heard of UBI than both Forerunners and Laggards.

[35] Although accepting a marginally higher level of significance would have signalled a difference between the distributions of responses obtained from Forerunners and Laggards, all three sub-groups did display a large degree of dispersion in their responses.

Table 4.12: Results of Kruskal-Wallis Tests for statements/questions relating to perceptions of usage-based insurance.

Statement/Question	N	Test statistic	Degrees of Freedom	Asymptotic Sig. (2-sided)
How relevant does the respondent believe VKT is in determining their level of driving risk?	565	5.919	2	0.052
How relevant does the respondent believe the rate of acceleration is in determining their level of driving risk?	565	15.366	2	0.000
How relevant does the respondent believe the location of travel is in determining their level of driving risk?	565	5.568	2	0.062
How relevant does the respondent believe the time of travel is in determining their level of driving risk?	565	9.085	2	0.011
How relevant does the respondent believe cell-phone usage while driving is in determining their level of driving risk?	565	13.711	2	0.001
How relevant does the respondent believe driving speed is in determining their level of driving risk?	565	33.048	2	0.000
How relevant does the respondent believe sharpness of braking is in determining their level of driving risk?	565	23.419	2	0.000
How relevant does the respondent believe sharpness of cornering is in determining their level of driving risk?	565	17.800	2	0.000
I believe that subscribing to a UBI policy would reduce the overall cost of insurance on the car that I drive most regularly.	497	95.182	2	0.000
I believe that I would drive less if the premiums on the car that I use most regularly were linked to my driving distance.	497	6.352	2	0.042
I believe that I would exceed the speed limit less often if the premiums on the car that I use most regularly would be decreased as a result.	497	26.761	2	0.000
I believe that UBI policies are fairer than traditional insurance policies because policyholders pay according to more accurate risk profiles.	565	73.762	2	0.000
I believe that South African roads would become safer if the driving behaviour of all road users was monitored.	565	33.017	2	0.000
I believe that other road users would exceed the speed limit less often if their insurance premiums would be decreased as a result.	565	19.163	2	0.000

(Source: Own)

Table 4.13: Pairwise comparisons between Forerunners, Non-Partisans and Laggards for statements/questions relating to perceptions of usage-based insurance.

Statement/Question	Forerunner—Non-Partisan		Non-Partisan—Laggard		Forerunner—Laggard	
	Test statistic	Adjusted Sig.	Test statistic	Adjusted Sig.	Test statistic	Adjusted Sig.
Perceived relevance: Acceleration	22.196	0.523	43.801	0.025	65.996	0.000
Perceived relevance: Time of travel	23.758	0.439	27.866	0.280	51.625	0.008
Perceived relevance: Cell-phone usage while driving	39.788	0.016	12.789	1.000	52.577	0.001
Perceived relevance: Driving speed	44.009	0.016	51.084	0.004	95.093	0.000
Perceived relevance: Sharpness of braking	32.836	0.132	49.306	0.009	82.142	0.000
Perceived relevance: Sharpness of cornering	33.949	0.110	37.818	0.065	71.767	0.000
I believe that subscribing to a UBI policy would reduce the overall cost of insurance on the car that I drive most regularly.	82.310	0.000	70.912	0.000	153.222	0.000
I believe that I would drive less if the premiums on the car that I use most regularly were linked to my driving distance.	29.280	0.175	8.331	1.000	37.612	0.052
I believe that I would exceed the speed limit less often if the premiums on the car that I use most regularly would be decreased as a result.	56.975	0.001	20.705	0.555	77.680	0.000
I believe that UBI policies are fairer than traditional insurance policies because policyholders pay according to more accurate risk profiles.	90.001	0.000	54.724	0.003	144.725	0.000
I believe that South African roads would become safer if the driving behaviour of all road users was monitored.	71.496	0.000	19.569	0.694	91.065	0.000
I believe that other road users would exceed the speed limit less often if their insurance premiums would be decreased as a result.	56.902	0.001	11.844	1.000	68.746	0.000

(Source: Own)

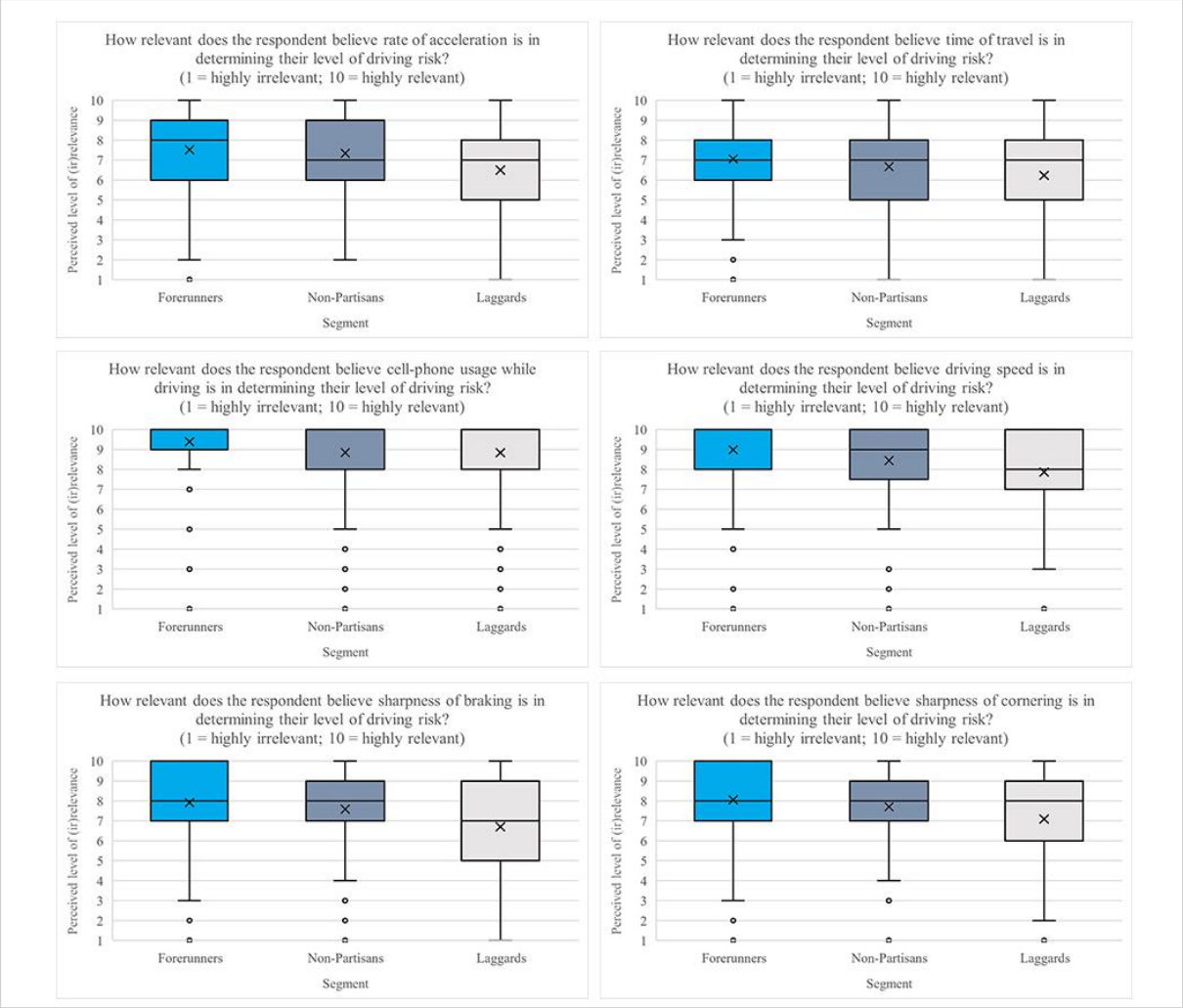

Figure 4.39: Visualised results of Kruskal-Wallis Tests for perceived relevance of driving behaviour monitoring.

(Source: Own)

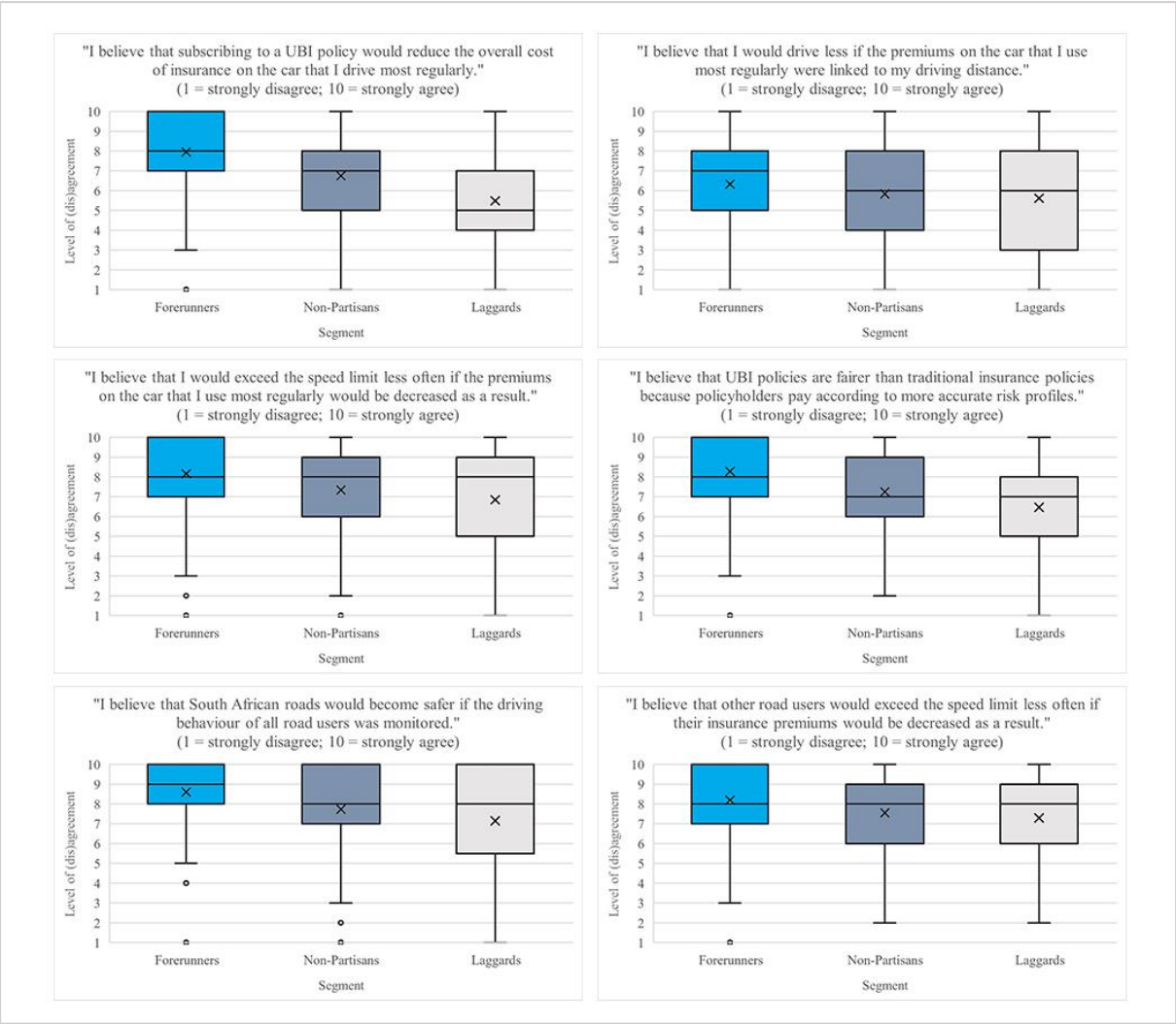

Figure 4.40: Visualised results of Kruskal-Wallis Tests for statements relating to belief in the potential benefits of usage-based insurance.

(Source: Own)

4.3.6 Digital Readiness and Acceptance

In the collection of statements/questions relating to digital readiness and acceptance, significant results were obtained in all eleven omnibus tests.

All of the omnibus tests concerning questions that related to respondents' level of comfort with behaviour monitoring yielded statistically significant results at a particularly low level of significance. Forerunners were typically more comfortable with the idea of having the aspects of driving behaviour often considered by modern UBI providers monitored for insurance purposes than both Non-Partisans and Laggards. Other than in the case of VKT, Non-Partisans were also generally more comfortable with having all aspects of their behaviour monitored by insurers than Laggards.

Among the 536 sampled drivers who indicated that they made use of digital channels for banking transactions, Forerunners generally showed slightly less dispersion relating to their level of confidence when using these channels than Non-Partisans—resulting in a significant difference between the

distributions of these groups. Similar results, albeit with a larger degree of dispersion among all three groups, were obtained when respondents' confidence while completing non-specific online purchases was probed. Relatively high levels of confidence among most participants, however, prevented more-pronounced results. These results can be seen in Figure 4.41.

Laggards were typically in stronger agreement that smartphone applications that monitor the location of users are an invasion of privacy than Forerunners. This, combined with the group's general sentiment outlined above, suggested that Forerunners may be the least opposed to the prospect of having their location monitored. The statements relating to location monitoring did, however, yield a large degree of dispersion among all three sub-groups—highlighting the sample's mixed sentiment towards this aspect of behaviour monitoring.

Table 4.14: Results of Kruskal-Wallis Tests for statements/questions relating to digital readiness and acceptance.

Statement/Question	N	Test statistic	Degrees of Freedom	Asymptotic Sig. (2-sided)
How comfortable would the respondent be with their VKT being monitored by an insurer?	565	35.081	2	0.000
How comfortable would the respondent be with their acceleration being monitored by an insurer?	565	155.803	2	0.000
How comfortable would the respondent be with their location of travel being monitored by an insurer?	565	35.378	2	0.000
How comfortable would the respondent be with their time of travel being monitored by an insurer?	565	43.838	2	0.000
How comfortable would the respondent be with their cell-phone usage while driving being monitored by an insurer?	565	60.432	2	0.000
How comfortable would the respondent be with their speed being monitored by an insurer?	565	126.370	2	0.000
How comfortable would the respondent be with their braking being monitored by an insurer?	565	126.419	2	0.000
How comfortable would the respondent be with their cornering being monitored by an insurer?	565	119.244	2	0.000
How confident does the respondent feel when completing banking transactions using their smartphone or computer?	536	9.083	2	0.011
I feel confident when making purchases online or via smartphone applications.	565	6.343	2	0.042
Smartphone applications that monitor the location of users are an invasion of privacy.	565	19.910	2	0.000

(Source: Own)

Table 4.15: Pairwise comparisons between Forerunners, Non-Partisans and Laggards for statements/questions relating to digital readiness and acceptance.

Statement/Question	Forerunner—Non-Partisan		Non-Partisan—Laggard		Forerunner—Laggard	
	Test statistic	Adjusted Sig.	Test statistic	Adjusted Sig.	Test statistic	Adjusted Sig.
Perceived comfort: VKT monitoring	68.601	0.000	24.757	0.363	93.358	0.000
Perceived comfort: Acceleration monitoring	79.610	0.000	131.529	0.000	211.139	0.000
Perceived comfort: Location monitoring	49.926	0.007	52.000	0.005	101.926	0.000
Perceived comfort: Time of travel monitoring	62.456	0.000	49.658	0.008	112.114	0.000
Perceived comfort: Monitoring of cell-phone usage while driving	77.383	0.000	53.237	0.004	130.620	0.000
Perceived comfort: Speed monitoring	85.722	0.000	105.131	0.000	190.853	0.000
Perceived comfort: Braking monitoring	68.601	0.000	120.851	0.000	189.452	0.000
Perceived comfort: Cornering monitoring	70.641	0.000	113.829	0.000	184.470	0.000
How confident does the respondent feel when completing banking transactions using their smartphone or computer?	42.658	0.014	-5.487	1.000	37.171	0.057
I feel confident when making purchases online or via smartphone applications.	39.565	0.045	-8.964	1.000	30.601	0.217
Smartphone applications that monitor the location of users are an invasion of privacy.	-41.729	0.032	-34.523	0.113	-76.252	0.000

(Source: Own)

No relationship was observed between whether insured vehicle owners already made use of their insurers' smartphone application and their corresponding level of interest in UBI, χ^2 (2, N=70) = 4.52, p = 0.10. One might have expected a higher likelihood of adopting UBI among those who used digital insurance channels already, however, this hypothesis could not be confirmed—perhaps as a result of the limited size of the sub-sample. Similarly, no significant association was identified between whether respondents already made use of digital channels for personal banking transactions and their associated level of interest in UBI, χ^2 (2, N=565) = 0.10, p = 0.95. Given that smartphone proliferation and the use of mobile- and internet banking was near-ubiquitous among the sample, this result was not unexpected.

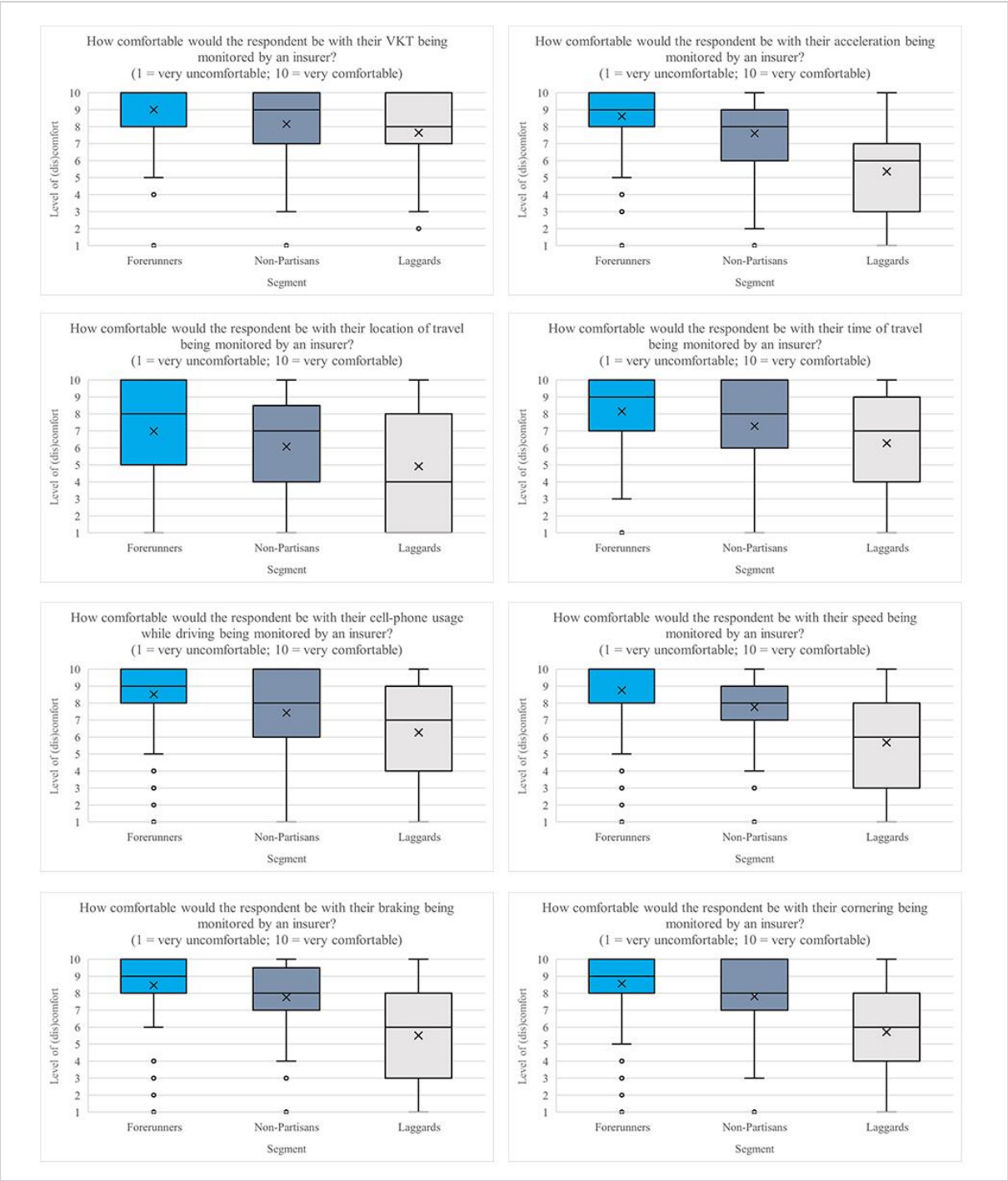

Figure 4.41: Visualised results of Kruskal-Wallis Tests for respondents' sense of comfort towards driving behaviour monitoring.

(Source: Own)

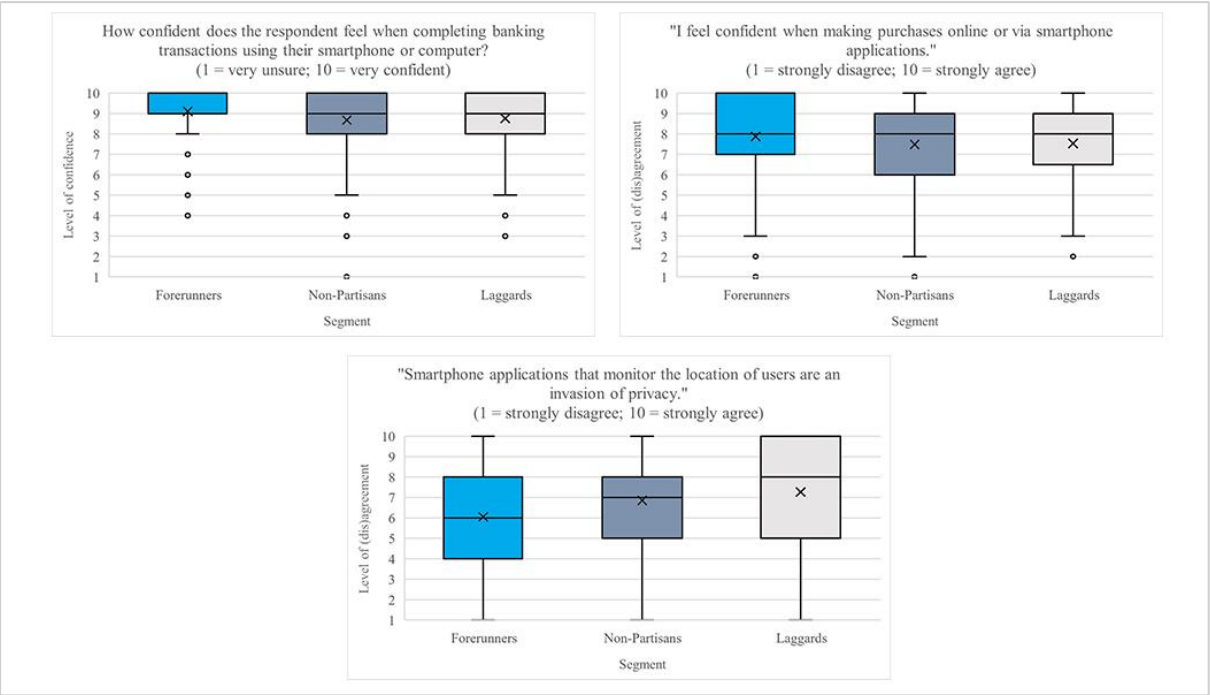

Figure 4.42: Visualised results of Kruskal-Wallis Tests for statements relating to digital readiness. (Source: Own)

4.4 Summarised Survey Results

UBI that includes driver behaviour monitoring appeared unlikely to garner immediate- and ubiquitous preference over traditional vehicle insurance among the youthful segment. Three sub-segments of the youthful segment were proposed and defined—namely Forerunners, Non-Partisans and Laggards—each with varying levels of interest in UBI policies that include consideration for multiple aspects of driving behaviour. These groups were akin to those proposed by Friedman & Canaan (2014:4), which were defined by respondents' willingness to accept behaviour monitoring via smartphone applications in exchange for possible premium discounts.

With close to 59 percent of respondents having never heard of UBI, prior knowledge of this type of policy was notably modest among young drivers. This despite 88 percent of respondents using vehicles with some form of coverage most regularly. Even among the sub-group of respondents comprised of vehicle owners, most respondents had no prior awareness of UBI. Among the sub-groups defined by their level of interest in UBI, Non-Partisans were found to have the lowest levels of prior awareness of UBI. As a result, a large proportion of the youthful segment remains a proverbial blank canvas, and it is suggested that insurers capitalise on this by bolstering their efforts to spread accurate information about their UBI offerings.

Underpinned by a large share of non-vehicle owners, the sample was largely bifurcated in terms of its awareness of the costs of coverage. Even among insured vehicle owners, more than 40 percent of respondents shared the belief that they did not understand how the premiums on the car that they drove

most regularly were determined by the insurer. Forerunners did not necessarily show greater cost awareness or greater perceived understanding of how premiums are set than the other sub-segments. Despite mixed cost awareness, more than two-thirds of respondents shared the belief that their driving ability should translate to lower premiums. This came as a result of near-universal self-confidence among respondents in their driving ability, which was evidenced by more than 85 percent of respondents agreeing to some degree that they were better-than-average drivers. This statement resonated with respondents from all three sub-segments, suggesting that promoting UBI as "insurance for good drivers" is likely to garner fairly widespread consumer appeal.

Most respondents, whether vehicle owners or not, indicated that the policy that covered the car that they used most regularly had not been changed within the previous two years. Among those whose policies had been changed recently, most cited price as an important reason for the change. Although a relatively small number of responses limited generalisability, when respondents were asked to indicate the minimum percentage saving necessary to entice them to change policy, the mean-, median- and mode were 21.9, 20.0 and 20.0 respectively.

While the allure of long-term cost savings resonated with a slim majority of the sample, more than 42 percent of all respondents showed some degree of preference for more-expensive flat-rate tariffs. Somewhat unexpectedly, Forerunners were not necessarily free from this fondness of flat-rate tariffs.

Based on the responses obtained from multiple questions, encouraging significant VKT curtailment would appear to be a tall order among a large proportion of respondents. The sample as a whole indicated fairly strong adherence to routine in their travel patterns. Additionally, the vast majority of respondents indicated that they did not like to rely on others for lifts and that they enjoyed the flexibility afforded by private vehicles. These results were consistent across the three proposed sub-segments. Despite most respondents—particularly those from the Forerunner sub-segment—indicating that they actively considered ways to reduce their travel costs, a considerable proportion of respondents indicated that they would not typically drive less in response to increases in the price of fuel—further suggesting inflexibility in their travel needs. In addition, largely mixed results were obtained when respondents were asked to indicate how strongly they (dis)agreed that linking insurance premiums to driving distance would encourage VKT curtailment. Close to 40 percent of respondents disagreed (with varying levels of intensity) with the statement at hand. Similarly, when asked to select the strategy that they would prioritise to reduce their VKT if they were to subscribe to a UBI policy, close to one-fifth of respondents indicated that they would not reduce their VKT at all.

An illustrative importance-performance analysis highlighted respondents' bleak attitudes towards the performance of public transport in several important attributes. Particularly apparent mismatches between importance and performance were observed in respondents' ratings of *safety and security* and *reliability*. The poor sentiment that was typically shown towards public transport may lead one to believe

that motorists typically treat public transport as an *inferior good*[36]. Put differently, those who use public transport are somewhat captive and choice ridership is undermined by poor perceptions of quality. As a result, the likelihood of achieving VKT reductions through modal shifts appeared slim for most young drivers. Despite poor perceptions of existing public transport, most respondents did indicate a strong willingness to use a much-improved public transport offering. The proposition of wholly substituting private car use with this improved public service, however, divided opinions. A stronger willingness to use a much-improved public transport offering was observed among Forerunners than Laggards.

Although VKT-linked incentives such as those afforded by UBI may face an uphill battle in reducing VKT through exacting modal shifts, they may yet hold value in encouraging more-prudent route planning, carpooling and the curtailment of discretionary trips. While a total reliance upon lifts was typically viewed negatively, *sharing lifts more often* was the modal response when participants were asked to select the strategy that they would prioritise to reduce their VKT if they were to subscribe to a UBI policy. In contrast, just 5.8 percent of respondents indicated that they would reduce their VKT by making use of public transport more often. Similarly, when asked what mode respondents would use if their primary mode were to become unavailable, more than 40 percent of the sample indicated that they would share lifts, while less than five percent of respondents stated that they would make use of public transport. Lift sharing also presents an opportunity for motorists to curtail their VKT without having to rely on perceivably inadequate public transport. These results suggest that sharing lifts may be tolerable on occasion if the corresponding incentives for VKT curtailment are adequate.

While the attainment of VKT curtailment appeared to be implausible among a noteworthy share of respondents, encouraging results were obtained when respondents were asked whether they believed that UBI could engender improved speed limit compliance among both themselves and other drivers. This belief was particularly pronounced among Forerunners. Two hypothesised underpinnings are put forward for this discrepancy:

1. Young motorists typically view improved speed limit compliance to be more attainable than curtailed VKT. This may be because the choice to obey a speed limit can be made instantaneously and without planning or perceived exertion (Bolderdijk & Steg, 2011:19).
2. Young motorists typically view speed limit compliance to be of greater relevance than curtailed VKT in the context of driving risk and, accordingly, recognise the rationale behind speed monitoring by insurers.

Although the group as a whole showed mixed sentiment towards the likelihood of UBI delivering cost savings for clients, most respondents agreed that UBI policies are fairer than traditional policies. In response to statements relating to both potential cost benefits and fairness, the most positive results were

[36] The term *inferior good* is used to describe a product that is purchased less as an individual's income increases.

obtained from Forerunners, while the opposite was true of Laggards. Similarly, most respondents—particularly those considered Forerunners—were in relatively strong agreement that universal driving behaviour monitoring would yield road safety benefits in the South African context.

A high level of digital competence was observed among the vast majority of the sample, suggesting that most of the youthful segment would not experience great difficulty utilising the hardware and software typically associated with modern UBI policies. Smartphone ownership was near-universal, and almost all respondents knew how to perform core tasks such as downloading- and updating applications and toggling their device's location settings between on and off. Close to 95 percent of the sample made use of either their smartphones or computers to complete banking transactions and the vast majority did so with fairly strong confidence—providing suggestion of both a willingness- and an ability to make use of digital channels within the financial services sector. Most respondents also reported fairly strong confidence in their ability to make non-specific purchases via digital channels.

Other than in the case of location monitoring—which was met with largely mixed sentiment—Forerunners typically viewed all of the aspects of driving behaviour considered to be more relevant in influencing driving risk than both Non-Partisans and Laggards. Among the aspects of driving behaviour considered, almost all respondents shared the view that cell-phone usage while driving is particularly risky. When asked how (un)comfortable they would be with having these aspects of their driving behaviour monitored, respondents typically appeared marginally more hesitant towards location monitoring than any of the other aspects considered, while the opposite was true of VKT. In general, Forerunners were more comfortable with the prospect of behaviour monitoring than both Non-Partisans and Laggards.

Despite considerable smartphone proliferation and digital competence, an apparent preference for dedicated plug-in devices over smartphone applications emerged when respondents were asked to indicate their favoured means of behaviour monitoring. Most respondents also shared the belief that smartphone applications that monitor their users' location are an invasion of privacy. These results may be somewhat concerning for UBI providers as application-based driving monitoring has been suggested as a means to lower costs and hasten feedback (Friedman & Canaan, 2014:4; Simpson *et al.*, 2014:10).

Selected insights obtained from the survey are presented in Figure 4.43.

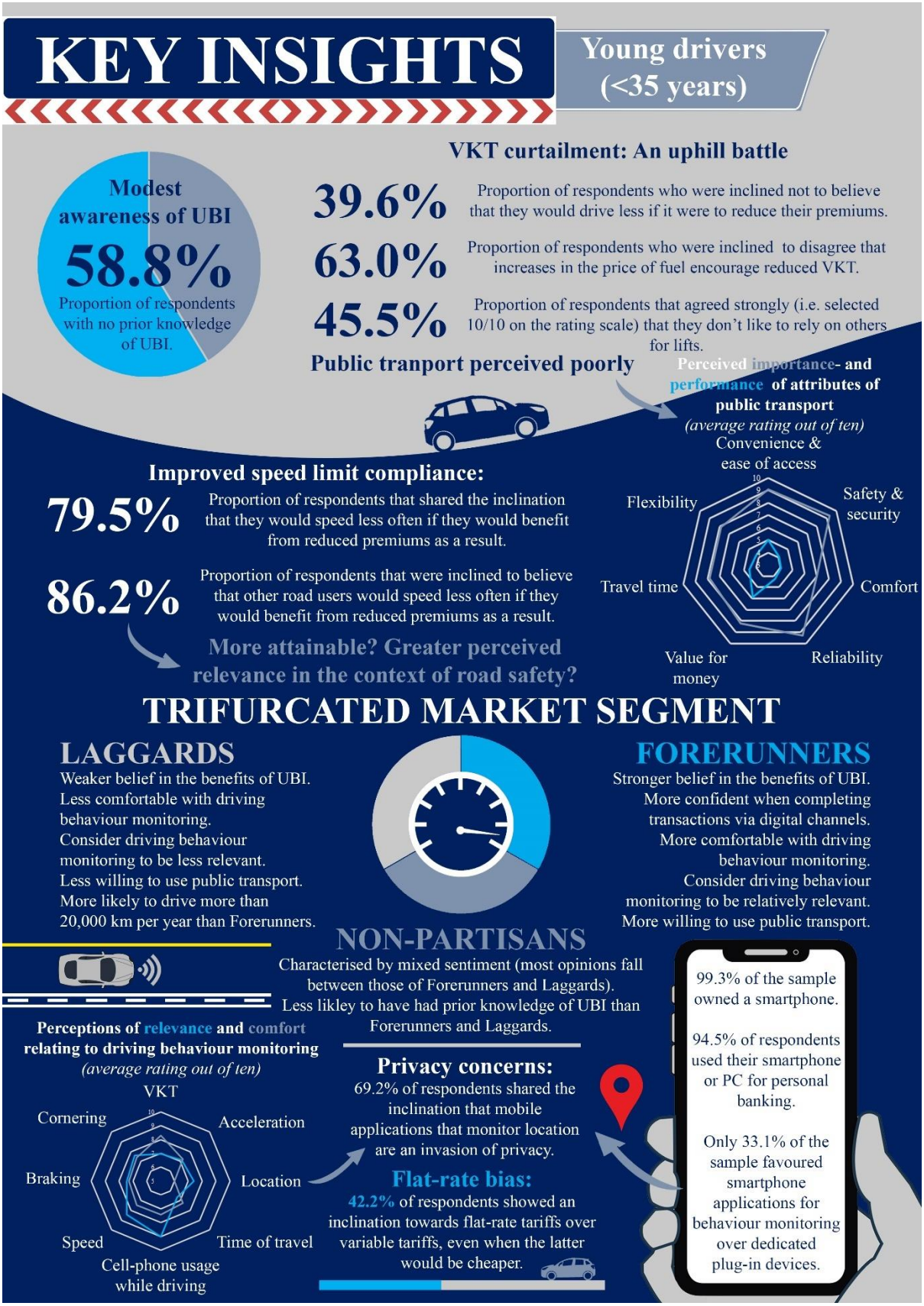

Figure 4.43: Selected survey insights.

(Source: Own)

5 BEHAVIOURAL INSIGHTS FOR USAGE-BASED INSURANCE PRODUCT DEVELOPMENT

Behavioural economics is a sub-discipline of economics that employs insights from the field of psychology to understand- and explain economic decisions among humans, which, in practice, often contradict the concept of perfect rationality typically assumed by classical economic theory. Per Discovery Insure, the appropriate application of concepts from behavioural economics can improve motorists' driving behaviour. Accordingly, by designing the Vitaly Drive programme with behavioural insights at its core, the company believed it would widen the extent to which its UBI product could deliver value for policyholders, insurers and broader society (Discovery Insure, 2021:7).

The purpose of this supplementary chapter is two-fold. Firstly, it serves to highlight some of the challenges that UBI providers are likely to face as a result of the inherent nature of tariff structures that are linked to usage. Secondly, it provides suggestions on how UBI policies could be structured and promoted to potentially improve their likelihood of consumer adoption and retention, as well as their potential for fostering broader societal value. To this end, the findings of behavioural research from both insurance- and non-insurance contexts were drawn upon, and attempts were made to apply lessons learnt to the development- and promotion of UBI policies. While priority was placed on UBI policies, some of the suggestions made are also applicable to traditional vehicle insurance products.

5.1 Deductibles, Surcharges and Rebates Through the Lens of Prospect Theory

Kahneman & Tversky's (1979) eminent *prospect theory* provides insight into how consumers make choices with uncertain outcomes and, by doing so, routinely display decision-making behaviour that would be considered irrational under traditional expected utility theory. The theory proposes that individuals' perceptions of outcomes can be represented by a value function with three fundamental characteristics. Firstly, the gains and losses are defined according to deviations from a reference point. Secondly, gains are represented by a concave curve, while losses are represented by a convex curve—implying that both gains and losses are met with diminishing responsiveness. Lastly, the loss function is steeper than the gain function, meaning that individuals are generally more sensitive to losses than equivalently-sized gains—a well-established phenomenon known as *loss aversion*. While the value function explained by prospect theory describes single events, Thaler (1985) builds upon this theoretical foundation to explain how event combinations can be framed to maximise consumer utility using the following four principles:

1. Multiple gains should be segregated to exploit the concave shape of the gain value function.
2. Multiple losses should be integrated to take advantage of the convex shape of the loss value function.
3. Small losses should be integrated with larger gains to offset the effect of loss aversion.

4. Small gains should be segregated from relatively large losses to capitalise on the steepness of the gain value function near the origin (referred to by Thaler (1985) as the *silver lining principle*).

The outcome of the theoretical underpinnings outlined above is that individuals tend to show preference towards event combinations based on the way that the outcomes are framed, even if the financial outcomes are arithmetically equal (Sinha & Smith, 2000; Thaler, 1985; Zhang & Sussman, 2018).

By incorporating these principles into the way that insurance tariffs are structured, insurers may stimulate increased value among their client bases. One such example relates to the use of deductibles—a common device used by insurers to curb the likelihood of policyholders increasing their exposure to risk simply because they are aware that they are covered against losses (i.e., moral hazard). With this type of mechanism in place, policyholders pay a fixed contribution towards each loss that materialises in addition to their usual insurance premiums. The result is that these expenses may be viewed by policyholders as segregated losses, making the expenses highly salient. An alternative approach for reducing the likelihood of moral hazard might, for example, be to charge policyholders a higher monthly premium while offering a rebate if claims remain below a specified value over a given period. If a policyholder is involved in an accident, they would not incur any additional charges as the deductible would be incorporated into the usual premiums. Because of the diminishing sensitivity to losses, the increase in premiums used to incorporate the deductible would be viewed as a relatively small loss. By integrating losses, the policyholder's overall displeasure would be minimised. If a policyholder remains claim-free and, as a result, receives a rebate, the loss of the insurance premiums would be offset in part by the gain of the rebate. According to the theoretical principles of Thaler (1985), this tariff structure would be preferred over an equivalent policy with a deductible, regardless of whether the policyholder files a claim. This framing effect was explored by Johnson, Hershey, Meszaros & Kunreuther (1993), and the study confirmed that individuals were significantly more likely to prefer a rebate policy over a deductible policy.

The threat of moral hazard is particularly concerning for insurers with policies that provide coverage to clients at an equivalent price regardless of their driving behaviour (i.e., traditional flat-rate policies) while, in general, the tariff structure of UBI policies continually invites clients to reduce their exposure to risk by incentivising desirable driving behaviour. In traditional policies with rebates, policyholders are only rewarded for avoiding accidents, while modern UBI policies present direct benefits for displaying responsible driving traits which, in turn, reduce accident likelihood. Despite this discrepancy, timing issues relating to the behaviour-based incentives provide a similar opportunity to incorporate the principles of Thaler (1985) into the tariff structures of UBI policies. For example, an insurer may opt to split its charges into fixed- and variable components, with the latter coming in the form of either a rebate

or surcharge based on revealed driving behaviour. This variable component could be established in one of two ways:

1. Ex-ante (i.e., prospectively): policyholders pay only the fixed component upfront and face a surcharge based on their driving behaviour.
2. Ex-post (i.e., retrospectively): policyholders pay both the fixed component and maximum variable component upfront, with the chance to earn a rebate if desirable driving behaviour is displayed.

According to the framing principles of Thaler (1985), the ex-post approach outlined above would be valued more by policyholders than the alternative, regardless of their revealed driving behaviour (assuming that the financial outcomes are arithmetically equal). If the ex-post approach is used and safe driving behaviour is displayed by a policyholder, the resulting gain (i.e., rebate) would be segregated from the relatively large initial payment, allowing the client to derive higher utility than if they were to make a smaller initial payment without the possibility of earning a rebate. In the case of undesirable driving behaviour, the ex-post approach would not require the policyholder to pay a surcharge and, accordingly, would prevent the client from framing the total charge as two separate losses. By allowing the losses to be integrated, the ex-post approach would minimise consumer displeasure by exploiting the convex shape of the loss value function. Musiol & Steul-Fischer (2019) demonstrated that this theoretical inclination towards the ex-post approach could have a significant positive effect on the purchase intentions of consumers, especially if the potential rebate is large.

Opting for the ex-post approach would not only bode well for the insurer by fostering a higher likelihood of consumer acceptance, but also by giving the insurer the opportunity to benefit from the time value of money through earning greater investment income on the larger initial payment. While the ex-post approach may appear to be more desirable to both the consumer and the insurer, the ex-ante approach may prove to be a stronger deterrence against undesirable driving behaviour as a result of the looming threat of facing segregated losses. The insurer is hence faced with the dilemma of choosing between the tariff structure that appears to be more desirable on the surface, and an alternative that is more likely to encourage improved driving, which, in turn, would deliver net savings for the consumer.

5.2 The Gift of Giving: Valuing Non-Financial Rewards

Mental accounting, a concept first described by Thaler, contends that individuals view- and value money—a distinctly objective medium of exchange—differently based on subjective factors such as its source and planned use (Thaler, 1999:183). One facet of mental accounting is that people tend to classify money into specific mental accounts, budgets and categories—each treated according to a different set of rules. While this categorisation process can ease the cognitive burden of financial decisions (Zhang & Sussman, 2018:2), the outcome is often a violation of the *fungibility principle*—the rational notion that money is perfectly substitutable and indistinguishable (Thaler, 1999:185; The Decision Lab, n.d.).

It has been argued that individuals tend to set certain mental budgets intentionally low in a bid to encourage self-discipline over their spending. The result of this is that people greatly appreciate gifts from a particular category that are of higher financial value than their normal budget for that category would allow. The perfectly rational economic notion that a non-monetary gift can at best be valued as much as a cash gift of equivalent value is hence undermined, and the proposition that the most-appreciated gifts are those that are somewhat more expensive than what the giftee would purchase for themselves is supported (Thaler, 1999:195). It has also been demonstrated that a considerable share of consumers gravitate towards luxury rewards over cash rewards, even in scenarios in which the latter is of greater value, as this ensures that the rewards are relished as opposed to being used for run-of-the-mill purchases (Kivetz & Simonson, 2002a). Similarly, participants of reward schemes have been shown to favour luxury rewards over equivalently-valued necessities in schemes that require higher levels of effort (Kivetz & Simonson, 2002b). Because of these consumer preferences, using luxurious gifts to either supplement- or replace cash in reward schemes has become a common practice across multiple sectors, and the insurance industry is no exception. In the South African context, Discovery Insure offers its policyholders *Vitality Drive Points* for displaying desirable driving behaviour, which contribute towards achieving weekly driving goals. If these goals are met, policyholders can participate in an in-application game that involves selecting a tile from an array of options—each of which with different mystery rewards. The rewards come in the form of varying amounts of *Discovery Miles*—the company's own reward currency. Policyholders can subsequently redeem their accumulated Discovery Miles at retail outlets and service providers from a range of categories, including *meals and entertainment*, *shopping*, *travel*, *entertainment and spoils* and *smoothies and snacks* (Discovery, n.d.).

5.3 A Penny Saved is a Penny Earned: Discouraging Windfall Gains

Much research exists to support the proposition that individuals tend to label changes to their existing income as either "regular" or "windfall", and display significantly less spending restraint with income that is categorised as the latter (Zhang & Sussman, 2018:2). In the case of UBI policies that pay rebates to clients whose usage remains below a specified threshold, how these rebates are transferred could impact how the funds are treated, potentially altering the personal- and societal value that these policies could hold. Because these rebates would be subject to variability from month to month if irregular driving behaviour is exhibited, policyholders may label the funds as a windfall and, accordingly, display a heightened marginal propensity to spend these funds. Insurers could assist these policyholders to exhibit self-control over their rebates by placing the funds directly into appropriate savings- or investment accounts with partner institutions. Similarly, UBI insurers could offer to transfer the potential savings that clients earn as a result of selecting a UBI policy (over a traditional policy) directly to a partner financial institution. While some clients may prefer to have full control over their rebates/savings, offering services that encourage saving may add further credibility to the insurer's pursuit of maximising shared value.

5.4 Fighting the Flat-Rate Bias: A Sisyphean Struggle or Worthwhile Pursuit?

A common assumption of standard microeconomic theory is that consumers maximise the utility that they derive from a given purchase when they select the tariff option that results in the lowest average cost over their anticipated usage (Lambrecht & Skiera, 2006:212). Despite this, mounting empirical evidence undermines the practical validity of this assumption of perfect rationality and planning ability among consumers. A common violation of this notion is consumers' routine inclination towards flat-rate tariffs over per-use tariffs, often even in cases in which they would save money with usage-linked tariffs (Lambrecht & Skiera, 2006:212). While this phenomenon was initially established in the telecommunications industry (Train, 1991), its presence has since been identified in other industries, including retail banking (Ater & Landsman, 2013), public transportation (Wirtz, Vortisch & Chlond, 2015) and health clubs (Nunes, 2000). As discussed in Section 4.2.4, a considerable proportion of young drivers who participated in the market segment assessment survey showed preference towards flat-rate insurance premiums, despite the variable tariff structure being described as more affordable over the long-term.

In the case of traditional flat-rate comprehensive insurance policies, clients pay in advance for their coverage. In other words, the purchase of the insurance product is made before its "consumption" takes place (i.e., the peace of mind associated with being covered while driving). Naturally, policyholders benefit from having peace of mind over risks that could materialise when their cars are not in use, such as theft, natural disasters, fire, civil disturbances and falling objects, as soon as their coverage is purchased, however, the benefit that they assign to knowing that they will be compensated in the event of an accident or hijacking is arguably only realised when driving takes place. In this type of policy, the payment for coverage can hence be said to be partially decoupled from its consumption. The result of payment decoupling is that clients tend to perceive the costs to be lower than if they were to be charged according to a per-use pricing policy (Thaler, 1999:192). Conversely, charging for coverage based on usage increases the perceived apparency and vividness of the link between payment (i.e., premiums) and consumption (i.e., peace of mind related to driving risk)—an undesirable outcome dubbed the *taxi meter effect* that encourages a preference towards flat-rate tariffs.

Consumers may view the process of identifying- and evaluating their policy options as a hindrance and, as a result, actively avoid this perceived mental exertion by selecting the option that appears to align with what they are used to choosing (Lambrecht & Skiera, 2006:214). This preference for maintaining the status quo may impede insurers' attempts to encourage sign-ups for policies with alternative pricing structures, particularly if consumers have not sagaciously evaluated the cost differences that are likely to exist between their options, given their specific contexts. The result of this effect is that consumers attach value to the simplicity of flat-rate tariffs. To contribute towards overcoming this effect, insurers should provide clients with easily accessible- and understandable information about their policies and, where possible, offer tailored estimates of how much policyholders could expect to pay for each of the

companies' options. It has been shown across multiple industries that, when in pursuit of improving their awareness of the costs that they would incur with a particular purchase, consumers appreciate assistance with performing cost calculations (Bonsall, Shires, Matthews, Maule & Beale, 2004:10). By compiling an impartial selection of personalised quotations from multiple insurers, insurance comparison websites, such as *Hippo.co.za*, may too prove useful in overcoming the mental burden associated with selecting a new policy. Because rate-making in many modern UBI policies requires accurate information about policyholders' driving behaviour, insurers that use smartphone applications for monitoring purposes could offer potential clients limited access to these applications over a specified period to monitor their behaviour and subsequently provide individualised quotations. In addition to highlighting potential cost savings, this approach may allow insurers to quash unfounded concerns held by some consumers about behaviour monitoring. In the South African context, Dialdirect allows smartphone users to gain access to core features on its driver monitoring application without having subscribed to one of the company's policies. Extending this offer to include quotations may ease the effort that consumers would usually have to exert when evaluating the cost benefits of the company's UBI policy. This approach has been adopted by Progressive in the form of its *Snapshot Road Test*—a 30-day free trial that culminates in personalised insurance quotations based on users' revealed driving behaviour (Progressive, 2020b).

Lambrecht & Skiera (2006:214) suggest that consumers' preference for flat-rate pricing over usage-linked options is further kindled by a tendency to overestimate the likelihood of using enough of a particular product or service to justify the flat-rate option. This habitual overestimation effect has been found to be particularly common among less-experienced users of a particular product or service (Nunes, 2000:407). As such, drivers with little experience in selecting an insurance policy or with limited insight about their own driving habits may favour policies with flat-rate premiums, even if they would, in practice, save money by subscribing to a UBI policy. From the perspective of an insurer, assisting drivers to bridge this information deficit could hold value in overcoming this effect. As suggested above, allowing potential clients to obtain limited access to the insurer's driver monitoring smartphone application could allow them to obtain insights about their own driving behaviour as well as the potential savings that they could benefit from if they were to change their policies. Offering this type of trial would allow new users to determine the suitability of the insurer's product for their needs without the risks associated with financial commitment. Additionally, trial users would be able to assess their own likelihood of adjusting their driving behaviour such that they would benefit from adopting the UBI policy. In a demonstration project conducted in Minnesota[37], it was found that participants who were exposed to a usage-based incentive scheme were significantly more likely to consider UBI after

[37] This demonstration project formed part of the same overarching study as the Minnesota-based surveys that were discussed in Section 2.4.

participating in the experiment than those who constituted the control group (Buxbaum, 2006b), suggesting that exposure to schemes of this nature may play an important role in their adoption.

Concern among consumers surrounding the variability of tariffs that they might experience under usage-linked pricing policies could contribute further to the tendency to prefer flat-rate options (Lambrecht & Skiera, 2006:213). This concern forms part of a well-established preference for known outcomes over those which are unknown—a phenomenon termed *ambiguity aversion* (behavioraleconomics.com, n.d.). By selecting an insurance policy with predictable monthly premiums, consumers safeguard themselves against higher charges during months of intensive driving. To douse these concerns, insurers could place either temporary- or permanent upper limits on the premiums of UBI policyholders. This *cost cap tariff* would represent a hybrid between traditional flat-rate premiums and usage-based premiums—policyholders would pay a usage-based tariff up until the upper limit is reached, after which no additional charges would be levied. By implementing a price cap, concerns about unexpectedly high tariffs would be abated, while policyholders would still be incentivised to improve their driving behaviour. Offering protection against unexpectedly high tariffs may also justify charging premiums at a higher unitary rate. This would, however, raise the question of whether the insurer's gains from the higher unitary rate would be enough to offset the cost of providing unlimited coverage to high-risk policyholders. Similarly, policyholders would not be encouraged to show driving restraint once the cap is reached, as the threat of incurring further losses would be removed. To ensure that drivers remain incentivised regardless of whether the price cap is reached, Greenberg (2010) suggests that, once the cap is reached, subsequent charges should be rolled over to the bills of future months. Alternatively, a temporary cost cap tariff could be framed as an "adaptation period" during which drivers are encouraged to learn how to adjust to their new policies without the risk of loss. During this period, to ensure that potential price hikes in subsequent months are not unforeseen, clients who reach the upper limit could still be informed of what their premiums would have amounted to had there been no cap in place.

Lambrecht & Skiera (2006) observed that some individuals with usage-linked tariffs end up paying more than they would under a flat-rate pricing structure, often as a result of underestimating their usage levels of the particular product or service. The research suggests that these individuals, upon becoming aware of their error, are significantly more likely to switch tariff or churn than those who favour flat-rate pricing despite paying more than they would under a usage-linked pricing structure. To ensure that policyholders do not exceed the breakeven usage point, Greenberg (2010) suggests that insurers provide meaningful tips on how clients could curtail usage and actively remind UBI clients that selecting a usage-linked policy was likely part of a plan to achieve a lower billing rate. This could serve to deflate the size of the mental accounts to which clients allocate their vehicle insurance charges, perhaps to the extent that paying a premium for flat-rate policies becomes unjustifiable.

5.5 Payment Frequency: Walking the Tightrope

Thaler (1999) proposes that individuals show heightened sensitivity to opportunities for savings in instances where the savings are large, relative to the price. Greenberg (2010) suggests that this principle could be applied to the payment frequency of UBI policies to encourage more-modest driving behaviour. For example, it is suggested that a UBI policyholder who is billed for their usage at shorter time intervals (i.e., those who face more segregated losses) would be more likely to take action to reduce their VKT than one who is billed less frequently, ceteris paribus. This is closely related to the effect of decoupling payment and consumption, as outlined above. While increasing the frequency of billing may encourage prudent trip planning, the insurer walks a fine line between encouraging responsible driving behaviour and increasing the salience of insurance expenses to the extent that the taxi meter effect becomes intolerable.

5.6 Fuelling Overconfidence

The effect of overconfidence among drivers is well-established. In arguably the most well-known study conducted to demonstrate the effect of overconfidence in one's own driving abilities relative to others—known as *illusory superiority*—Svenson (1981) observed that 93 percent of a sample of drivers from the United States considered their driving skills to be better than that of the median driver from the experiment. In a survey conducted partly in a South African setting, Sinclair (2013) observed that 99 percent of young respondents from the country rated their driving ability as either "excellent" or "good". A similar theme of self-adulation emerged in the results of the market segment assessment survey, with 85.7 percent of respondents inclined to believe that their driving ability was above-average (as discussed in Section 4.2.2).

It is suggested that insurers capitalise on this effect by emphasising that "good drivers" would stand to benefit from UBI policies. While the relationship between certain driving traits and premiums should be easily accessible to potential clients, the prevailing message in all advertising material should be that good drivers are rewarded.

In addition to the overconfidence that motorists tend to have in their driving ability, Greenberg (2010) suggests that optimism relating to one's own ability to display discipline in curbing VKT in the pursuit of premium savings may spur drivers to subscribe to a UBI policy.

While the overconfidence effects outlined above may play in favour of insurers by encouraging sign-ups, it is worth considering the potential responses that new policyholders who do not experience the benefits that they were confident about receiving might have.

5.7 Less is More: Valuing Simplicity in Tariff Structures and Goal-Setting

Cognitive limitations impair people's ability to receive, process and remember information (Haselton, Nettle & Murray, 2015:970; Miller, 1994:351)—an attribute that contributes to the already-mentioned

tendency to value, and perhaps even find comfort in, tariff structures that are straightforward and intuitive. Similarly, when confronted with too much information or a limited time frame in which to make onerous choices, individuals turn to simple decision heuristics to attain outcomes that are adequate, but not necessarily optimal (Kahneman, 2003; Simon, 1955). In the context of vehicle insurance policy choice, this phenomenon—dubbed *bounded rationality*—may cause clients to not select the policy with the lowest average cost, given their individual contexts (which, other things held constant, represents the purely rational choice). Consider the example of a policy with tariffs that are based on traditional rate-making factors, as well as the extent of vehicle use (i.e., the number of kilometres driven) and the manner of vehicle use (including aspects of driving behaviour such as acceleration, braking, cornering, speed, location, time and cell phone usage while driving). Incorporating this multitude of factors into tariff structures may introduce complexity that hampers policyholders' understanding of how their premiums are determined, making the evaluation- and comparison of policies challenging. As a result, the insurer may walk a fine line when structuring their policy's tariffs between the seemingly divergent principles of *simplicity* and *economic efficiency*[38].

Consumers have been found to show a marked preference towards options that require less cognitive effort (Garbarino & Edell, 1997) which, along with the effect that bounded rationality has on decisions, provides a strong case for simple tariff structures. Additionally, research in the area of ambiguity aversion—a topic introduced in Section 5.4—suggests that consumers will willingly select a sub-optimal option with known outcomes over an alternative that they do not fully comprehend due to the outcome uncertainty that may be introduced as a result (Bonsall *et al.*, 2004:15). Consequently, it might be argued that a policy with an easily comprehendible tariff structure could be favoured over the alternative with the lowest possible average costs. Albeit from a limited sample of young insured vehicle owners, the market segment assessment survey found that more than 40 percent of respondents showed some degree of uncertainty towards how their insurance premiums are calculated by the insurer—perhaps highlighting a potential opportunity for improved transparency.

Because of the complexity that may be introduced by incorporating several aspects of driver behaviour into a tariff structure, policyholders might turn to simple decision heuristics to assist them in their pursuit of achieving satisfactorily priced premiums. In other words, rather than relying on details about the actual rate-making calculations, which are arguably beyond the comprehension of most drivers, policyholders may draw upon past experiences and hearsay (Bonsall *et al.*, 2004:9) to develop mental shortcuts that inform their driving decisions. For example, in the closely-related context of road-user charging, Bonsall *et al.* (2004:10) propose that, in instances where multiple parameters are integrated into tariff structures, individuals try to identify- and prioritise the parameters that have the most

[38] This principle would be advanced through charging premiums that more-accurately reflect marginal risk by incorporating more aspects of driver behaviour.

considerable impact on their tariffs. To ensure that these heuristics are not misinformed, insurers themselves could convey simplified messages of how their charges are influenced by certain aspects of driving behaviour. By sharing personalised feedback on the types of changes that would most-strongly influence their tariffs, insurers may assist policyholders to objectively assign priority to specific behavioural changes.

Similarly, when the attainment of a particular goal seems complex and challenging, it has been found that breaking the goal down into several more-manageable sub-targets can significantly improve the likelihood of the goal being achieved (The Behavioural Insights Team, 2015:18). In the context of UBI, the broad objective of improving one's driving in an attempt to reduce premiums may be prevalent among policyholders. While this might seem straightforward on the surface, routinisation and driving behaviour that has been entrenched over years may make certain behaviours sticky in the short-run. To overcome this, the insurer could provide policyholders with tailored driving improvement targets that isolate specific aspects of behaviour and appear more achievable. In the South African context, participants from Discovery Insure's Vitality Drive programme are given two types of personalised driving goals. The first type—mentioned briefly in Section 5.2—involves drivers being allocated a number of Vitality Drive Points at the beginning of each week, which are subsequently depleted if harsh driving events are recorded. The points balance that remains at the end of each day contributes towards a weekly target—the attainment of which earns policyholders Discovery Miles. After each target is attained, new targets that require further improvements are set, encouraging drivers to continually strive for improved driving behaviour. The second type of goal involves monthly objectives, such as improving performance in a particular aspect of driving behaviour (for example, speed-limit compliance or acceleration) or attaining Vitality Drive Point targets over successive weeks within a given month. Because both types of goals are set based on policyholders' individual driving behaviour from previous months, the insurer not only breaks up the broad objective of driving improvement into attainable sub-targets, but also encourages improvement in the areas that need it most.

5.8 Strike While the Iron is Hot: Prioritising the Point-of-Sale

Greenberg (2010:6) suggests that policyholders' likelihood of switching vehicle insurance options is heightened when they alter their existing vehicle fleet. Because car dealerships and auctioneers play a significant role in facilitating a large share of vehicle transactions, partnerships between these businesses and insurers could present a timely opportunity to capitalise on this boosted sign-up likelihood at the point of vehicle sales. While this type of business-to-business-to-consumer (B2B2C) insurance model is not new, it is expected to grow considerably in popularity as a result of technological progress that makes supplementing partners' business models with insurance offerings more natural (Oliver Wyman, 2016:1). For example, certain vehicle marques, such as BMW and Mercedes-Benz, have recently added the option to purchase new- and used vehicles, as well as arrange financing, insurance, payment and

delivery, via their local websites—presenting an opportunity for insurers to integrate into partners' expanding sales channels.

5.9 Show & Tell: Capitalising on Opportunities for Benefit Demonstration

Events that significantly impact the financial position of policyholders, such as job losses or recessions, could force them to adjust the size of the mental accounts within which they classify insurance expenditures. Accordingly, this may prompt policyholders to alter their existing insurance policies to fit their altered mental accounts. Similarly, events that have noteworthy impacts on the regular travel routines of policyholders could call their attention to their travel-related expenditures, creating a potential opportunity for the benefits of variable insurance charges to be revealed to consumers. Insurers could see these events as ideal opportunities to market policies that appeal to price-conscious consumers by highlighting the cost benefits that they would hold. One such local company that would appear to have subscribed to this notion is King Price Insurance, which launched its Chilli UBI policy during the early stages of South Africa's COVID-19-induced lockdown—perhaps seeing the combination of travel restrictions and economic uncertainty as a unique opportunity to accentuate the potential benefits of the insurer's new policy.

5.10 Getting Their Money's Worth: Transaction Evaluations

Thaler (1985) proposed that two distinct types of value are incorporated into consumers' analyses of their purchase decisions, namely *acquisition utility* and *transaction utility*. Acquisition utility measures the value of the purchased good or service relative to the price at which it was purchased. In the context of vehicle insurance, policyholders would derive positive acquisition utility when they value the peace of mind associated with having coverage against certain losses to be greater than the cost of their monthly premiums. Transaction utility measures the perceived value derived from the deal itself and is reflected as the difference between the *actual* amount paid for a particular good or service and the amount that the consumer *expected* to spend on the purchase (known as the *reference price*). The reference price is largely a result of the perceived fairness of the deal. In the context of UBI policies, factors that contribute towards the perceived fairness of a particular product and, by extension, the reference price against which the merits of the deal are compared might include:

- the price of perceptibly similar insurance policies offered by competitors;
- the price of policies with other tariff structures (such as traditional flat-rate policies) offered by either the same insurer or its competitors;
- the price of policies with different types of coverage (such as third-party only) offered by either the same insurer or its competitors;
- the perceived value of the asset that the insurance policy covers;
- policyholders' perceptions of their own risk profiles;
- perceptions of the costs associated with driver monitoring; and

- the level of trust that the insurer holds.

Thaler (1985:211) suggests adopting one of three general strategies for raising the retail price of goods or services without inflicting undue negative transaction utility. This is particularly important in the context of UBI, given the costs associated with incorporating vehicle usage into rate-making. The first of these approaches involves making attempts to raise perceptions of the reference price held by consumers. This might involve offering peripheral features, such as vehicle tracking and recovery, roadside assistance and in-vehicle panic buttons, in addition to the core insurance product. A UBI provider might also attempt to differentiate itself from traditional insurers by positioning its services as part-insurance, part-driver-improvement-coach. In the South African market, Discovery Insure offers benefits to drivers who meet certain behaviour improvement goals and complete advanced driving courses, for example. Similarly, by highlighting the societal value that UBI policies may engender, insurers could find themselves viewed as altruistic advocates for causes such as road safety improvement and environmental protection—perhaps striking a chord with those who are willing to pay a premium for socially conscious products and services.

The next strategy involves linking the sale of the product or service to another product or service. In the context of vehicle insurance, this might, for example, involve attempts to encourage subscriptions at the point-of-sale of vehicles—a suggestion first introduced in Section 5.8. Because the consumer ties the price of the insurance policy to the substantially larger cost of a vehicle, the insurance costs would appear relatively insignificant. In accordance with the framing principles of Thaler (1985), integrating these losses (i.e., the purchase of a vehicle and an insurance policy) maximises the buyer's utility because of the convex shape of the loss function. The complementary nature of this particular product combination provides additional intuitive appeal.

A similar price-bundling approach may be used to capitalise on consumers' (sometimes irrational) proclivity for free goods and services—a phenomenon known as the *zero price effect.* Because individuals tend to inflate the benefits of free goods and services and ignore their opportunity costs (Shampanier & Ariely, 2007), it may be worth bundling insurance products with free offers to entice potential policyholders to subscribe. For example, a UBI provider could offer a specified number of free insured kilometres during the first month(s) of subscription. Other ideal free offers might include goods and services that either promote driver safety (such as windscreen wiper blades, eye tests and vehicle inspections) or that discourage driving (such as free public transit passes for policyholders in certain regions).

The final strategy involves actively attempting to blur the reference price so that the transaction disutility is made less apparent. Discovery Insure's reward structure provides a case in point. By offering reward points to good drivers instead of further cash discounts, the company arguably obscures the objective financial attributes of its policy. Consider the hypothetical scenario of a policyholder who routinely

spends their Discovery Miles on weekly takeout coffee from a partner cafe. In this example, the insurance policy is bundled, albeit indirectly, with an entirely unrelated good, making comparisons with other insurers' policies challenging. Contributing further to this effect is the uncertainty introduced by the in-application game—explained in Section 5.2—which ultimately determines the number of Discovery Miles that policyholders earn after achieving their weekly driving goals. It might also be postulated that not having a directly convertible exchange rate between the reward points and actual government currency (i.e., 1 Discovery Mile does not equal ZAR 1.00) may contribute towards this obscurity, although likely in a minor way. The company's policyholders are also given the option to earn up to 50 percent of their fuel spend back in cash instead of obtaining a premium reduction[39].

Based on the results of the market segment assessment survey, young drivers—particularly those from the Forerunners sub-segment—typically support the notion that UBI policies hold an upper hand over traditional policies from a fairness perspective. Because the reference price used to determine transaction utility is largely determined by the perceived fairness of the deal, the insurer should emphasise the inherent fairness of policies that are linked to usage in its marketing material. Similarly, the insurer could highlight reasons why flat-rate policies might be deemed unfair, such as traditional insurers' use of premiums collected from low-risk policyholders to cross-subsidise those that exhibit higher risk. Highlighting the link between each aspect of monitored driving behaviour and risk exposure should also form part of this strategy, as this may advance drivers' understanding of why these aspects are reflected in their tariffs. Furthermore, the insurer should make attempts to be as transparent as practicably possible with regard to how its charges are influenced by each aspect of monitored driving behaviour. An insurer that relies on GPS data for rate-making purposes could make precise details of clients' driving behaviour available on a driver profile on either the company's website or application, allowing the clients to see exactly what driving events influenced their tariffs. Because drivers, in general, overestimate their driving ability (Svenson, 1981), it may be useful to objectively point out which traits negatively influenced clients' tariffs—else unexpectedly high tariffs may lead to mistrust among self-proclaimed excellent drivers.

5.11 Following Suit: Leveraging Social Comparisons

While the bulk of this chapter focussed on considerations that may influence the likelihood of consumer acceptance of UBI policies, the following discussion relates primarily to the use of social comparisons to achieve improved driving behaviour. *Social comparison theory*, an ever-expanding branch of research in the field of social psychology, is built upon the fundamental notion that individuals have an intrinsic desire to accurately evaluate their own opinions and abilities, and tend to do so through comparisons

[39] While it may contribute to obscuring the reference price, this framing may encourage consumers to perceive the cashback as a reduction in the costs associated with travel—a seemingly counterintuitive approach that could encourage more travel.

with others (Festinger, 1954). Thornton & Arrowood (1966:46) built upon this by positing that comparisons of this nature facilitate both self-enhancement and self-evaluation. The former relates to comparisons with others that are made to intentionally improve one's assessment of themself, while the latter relates to determining where one stands relative to others.

In a well-known field experiment that included 600,000 households from across the United States, participants received reports that compared their own energy consumption to that of nearby households of similar size, as well as personalised suggestions on how they could reduce their consumption. The resulting average reduction in consumption was roughly two percent, which was equivalent to the effect induced by a five percent long-run increase in the cost of energy (Allcott, 2011:1083). In a closely-related study conducted in South Africa, reductions in energy consumption of between nine- and 14 percent were recorded among the floors of a high-rise government office block that were exposed to interventions that leveraged social comparison (Klege, Visser, Datta & Darling, 2018)—implying that the usefulness of this effect in achieving socially desirable outcomes transcends scenarios in which participants stand to earn direct incentives for their improved behaviour.

While studies on this topic that relate to energy consumption are among the most well-known, the potential of social comparisons to incite voluntary changes in behaviour has been explored across other contexts, including that of driver behaviour. In one such study, drivers from Tsingtao, China were sent text messages that included the number of traffic infringements that they had committed over a specified period, as well as the average number of infringements committed by other drivers with varying levels of perceived status (based on the marque of the vehicle that they owned). Drivers who had committed an above-average number of violations and received social information relating to drivers of the same marque were found to subsequently reduce the number of violations committed by an average of six percent. Furthermore, social information relating to the drivers of higher-end marques was found to reduce the number of infringements committed by an average of five percent, with particularly prominent results among drivers of lower-end marques (Chen, Lu & Zhang, 2017).

Because modern UBI policies are intrinsically reliant upon the collection of data relating to driver behaviour, adding social comparisons to these product offerings would not necessitate further data collection. Using smartphone application notifications, online user profiles and/or other communication channels (such as email or text message), UBI providers could juxtapose policyholders' individual driving behaviour against the aggregated behaviour of fellow clients. In the South African vehicle insurance setting, both Discovery Insure and Dialdirect have made efforts to leverage social comparisons to incite improved driving behaviour. Users of Dialdirect's driver monitoring application can, for example, invite friends and family members to participate in customised leagues and view their driving score relative to that of the country's best participating drivers. Similarly, Discovery Insure has, in past years, hosted a competition (known as the *Discovery Insure Driving Challenge*) in which

participants would compete against friends and family members based on their driving scores. In this competition, the insurer observed a 14 percent improvement in the driving scores of participants from groups with five or more drivers, while the scores of participants who did not form part of a group improved by only seven percent (Discovery Insure, 2018)—a clear demonstration of the potential that social comparisons can hold in encouraging improved driving. While local providers of UBI have employed social comparison measures through their ranking systems, these measures could be taken further to potentially improve the effectiveness with which they motivate improved driving.

A comparison between oneself and those who perform superiorly is known as an upward comparison. While it might be suggested that upward comparisons negatively affect self-esteem by highlighting one's own inferiority, Collins (1996:51) argues that construal significantly impacts how one responds to this type of comparison. Under certain circumstances, an individual may view the results of a superior performer as a realisable goal while downplaying the threat of ego deflation. It has been suggested that individuals use upward comparisons with marginally better performers to confirm their similarity with the better performers, and only experience demotivation if the performance gap is larger than expected (Suls, Martin & Wheeler, 2002; Wheeler, 1966). To capitalise on the aspirational effect of upward comparisons, insurers could provide clients with information relating to the driving behaviour of their slightly better-performing counterparts. These comparisons should emphasise the attainability of ranking improvements and could be combined with personalised tips on how policyholders could improve their standing most significantly. Furthermore, in a manner similar to that explored by Chen *et al.* (2017), insurers could also turn to social status as a basis for upward comparisons. For example, policyholders could be informed of the scores recorded by drivers of perceptibly high-status marques.

If a UBI insurer were to exclusively show the results of the best performers, the only standard that policyholders would have to compare themselves to is the top—a target that may seem unattainable for many. As such, policyholders who find themselves ranked mediocrely or poorly may lack motivation, while only those near the top of the ranking are driven to vie for the top positions. Because people have a general drive to be better than others, lower performers in a group of higher performers have been found to view themselves in low esteem—an effect dubbed the *frog pond effect* (McFarland & Buehler, 1995). To discourage apathy or resentment towards social comparisons, the insurer should avoid providing poorer performers with comparisons between them and the best performers. Evoked by negative affect, individuals can improve their subjective wellness by either actively- or passively comparing themselves to others who find themselves in less-favourable positions—a defensive technique known as a *downward comparison* (Wills, 1981:245). By encouraging downward comparisons among policyholders with low self-esteem, insurers may provide much-needed motivation for achieving improvements in the way that they drive. For example, a driver that has experienced a decline in their overall ranking might be informed that, despite their drop in performance, they remained better-ranked than others.

The observed group behaviour of people that one considers to be similar to oneself may encourage conformity to the collective conduct and, in doing so, produce a framework of behaviour that is deemed appropriate (Chen *et al.*, 2017:4). Furthermore, comparisons with individuals who possess abilities similar to one's own have been shown to produce self-evaluations that are more accurate than comparisons with individuals whose abilities differ (Wilson, 1973:605). Providers of UBI may encourage comparisons between one's own driving behaviour and that of others who share similarities. For example, the insurer could provide rankings of individuals who are (1) geographically proximate (such as those from who reside in the same neighbourhood, town or broader region), (2) demographically similar (such as those of the age group), (3) of the same level of perceived status (such as those who drive similar cars) and/or (4) part of the same social circles (such as friends and family). Additionally, comparisons of this nature can easily be combined with either upward- or downward comparisons. For example, a driver might be informed of their standing relative to others from their neighbourhood, while also being encouraged to narrow the gap between themselves and their higher-ranking counterparts.

While the focus of this discussion has been on the use of social comparisons to incite driving improvements among existing UBI policyholders, it should be noted that simple social comparisons could also be used in promotional material to encourage new subscriptions. For example, an insurer might use normative messages in an attempt to position itself as the preferred insurer for good drivers and, in doing so, take advantage of drivers' overconfidence in their driving ability. This might be achieved, in part, by highlighting existing policyholders' superior driving record—a strategy that Discovery Insure has not shied away from. In other words, knowing that other good drivers prefer a particular insurance policy might be enough to make drivers consider it as an option for themselves. Similarly, with assistance from marques, insurers could use normative messages to encourage subscriptions at the point-of-sale of new vehicles. For example, an insurer might mention that it is "the most trusted insurance provider" among drivers of a particular marque.

In summary, providers of UBI may be able to encourage voluntary improvements in policyholders' driving behaviour through the effective use of social comparisons. Insurers might attempt to do so through conveying social norms by making policyholders aware of the desirable aspects of driving behaviour displayed by others who share some sort of similarity. Additionally, insurers may use upward comparisons to encourage improvements in driving by fuelling a sense of aspiration and competitiveness among drivers who perform similarly. Insurers may also turn to downward comparisons as a means to motivate those in need of upliftment. Lastly, insurers could use social comparisons (in the form of normative messages) to encourage new subscriptions.

5.12 Concluding Remarks

This chapter set out to highlight challenges that UBI policies may face in encouraging consumer adoption and retention as a result of their variable tariff structure. Additionally, findings from behavioural research were applied to the UBI context with the intention of proposing strategies and product attributes that may improve the likelihood of achieving both consumer support and shared value. A summary of the key theories, concepts and sources referred to in this chapter is presented in Table 5.1.

Because modern UBI policies can vary significantly in terms of both tariff mechanisms and driver monitoring methods, a wide range of product attributes must be considered by insurers in the design- and subsequent roll-out of these policies. Each adjustment to these attributes brings with it impacts on the costs of implementation and upkeep, the relative ease of implementation, and actuarial accuracy—all of which can materially affect the commercial viability and likelihood of consumer adoption of the insurance product. Furthermore, certain attributes may impact the driving behaviour of policyholders which, in turn, would affect the extent of shared value that can be created by the UBI policy. Since product attributes may have seemingly divergent outcomes, trade-offs between them are to be expected. Greenberg (2010:5) uses the extent of driver monitoring to illustrate this—improved actuarial accuracy stemming from more-comprehensive behaviour monitoring is likely to bring about higher costs and concerns over privacy. Similarly, the tariff structure that most-accurately reflects driving risk may, in fact, drive consumers away from UBI policies by increasing the salience of the costs associated with each trip. Because South African motorists will, at least for the foreseeable future, have a choice between traditional property coverage, usage-based property coverage and simply having no property coverage at all, the commercial success of UBI policies is not likely to be hinged upon superior economic efficiency, but rather on their ability to deliver benefits—whether real or perceived—to consumers. As such, UBI providers may need to sacrifice some aspects of the economist's preferred vehicle insurance tariff structure in pursuit of achieving more-widespread consumer adoption and retention.

Table 5.1: Summary of key theories, concepts and sources referred to in Chapter 5.

Section Title	Key Theories & Concepts	Key Sources
Deductibles, Surcharges and Rebates Through the Lens of Prospect Theory	Prospect theory, loss aversion, framing effects, moral hazard	Johnson *et al.*, 1993; Kahneman & Tversky, 1979; Musiol & Steul-Fischer, 2019; Sinha & Smith, 2000; Zhang & Sussman, 2018
The Gift of Giving: Valuing Non-Financial Rewards	Mental accounting, fungibility principle	Kivetz & Simonson, 2002a,b; Thaler, 1999; The Decision Lab, n.d.; Zhang & Sussman, 2018
A Penny Saved is a Penny Earned: Discouraging Windfall Gains	Mental accounting, windfalls	Zhang & Sussman, 2018
Fighting the Flat-Rate Bias: A Sisyphean Struggle or Worthwhile Pursuit?	Flat-rate bias, payment decoupling, ambiguity aversion	Ater & Landsman, 2013; behavioraleconomics.com, n.d.; Bonsall *et al.*, 2004; Buxbaum, 2006b; Greenberg, 2010; Lambrecht & Skiera, 2006; Nunes, 2000; Thaler, 1999; Train, 1991; Wirtz *et al.*, 2015
Payment Frequency: Walking the Tightrope	Flat-rate bias, payment decoupling, prospect theory	Greenberg, 2010; Thaler, 1999
Fuelling Overconfidence	Illusory superiority	Greenberg, 2010; Sinclair, 2013; Svenson, 1981
Less is More: Valuing Simplicity in Tariff Structures and Goal-Setting	Bounded rationality, ambiguity aversion decision heuristics, goal-setting	Bonsall *et al.*, 2004; Garbarino & Edell, 1997; Haselton *et al.*, 2015; Kahneman, 2003; Miller, 1994; Simon, 1955; The Behavioural Insights Team, 2015
Strike While the Iron is Hot: Prioritising the Point-of-Sale	B2B2C models	Greenberg, 2010; Oliver Wyman, 2016
Show & Tell: Capitalising on Opportunities for Benefit Demonstration	Mental accounting	-
Getting Their Money's Worth: Transaction Evaluations	Transaction evaluations, acquisition utility, transaction utility, reference price, zero price effect, framing effects	Shampanier & Ariely, 2007; Thaler, 1985
Following Suit: Leveraging Social Comparisons	Social comparison theory, upward comparisons, downward comparisons, normative messages	Allcott, 2011; Chen *et al.*, 2017; Collins, 1996; Discovery Insure, 2018; Festinger, 1954; Klege *et al.*, 2018; McFarland & Buehler, 1995; Suls *et al.*, 2002; Thornton & Arrowood, 1966; Wheeler, 1966; Wills, 1981; Wilson, 1973

Source: Own

6 GLOBAL PERSPECTIVES ON THIRD-PARTY LIABILITY INSURANCE: COULD USAGE-BASED INSURANCE HAVE A ROLE TO PLAY?

In this chapter of the thesis, perspective shifts to that of the state and attention is turned to the topic of national insurance arrangements as a means to partially internalise the external costs associated with road transport through both compensation and deterrence.

This largely exploratory chapter draws upon various publicly available sources—including empirical studies, annual reports, annual performance plans, legislative acts and directives, expert- and industry reports as well as official websites—to review South Africa's existing third-party insurance arrangement and juxtapose it against that of some of the nation's international counterparts.

This narrative chapter begins with a brief description of the role of the RAF—the under-strain state insurer currently responsible for compensating victims of road accidents. Subsequently, the shortcomings of the insurer's operating model are outlined, with specific reference to its funding model and litigious claims process. In a closely related sub-section, the theoretical merits and drawbacks of a ring-fenced fuel levy are briefly outlined. This is followed by a succinct description of the now-quashed Road Accident Benefit Scheme (RABS)—the once-proposed replacement for the RAF. Because of the recent withdrawal of this proposed replacement, the future of South Africa's vehicle accident compensation scheme remains somewhat unclear. As such, the MTPL arrangements of some of South Africa's international counterparts are explored with the intention of highlighting the theoretical challenges that South Africa may face if it were to adopt an altered MTPL arrangement. In addition to identifying these potential stumbling blocks, attention is paid to efforts that have been made to adopt usage-based principles as part of nations' compulsory insurance arrangements.

6.1 Overview of South Africa's Public Insurance Scheme

The RAF—introduced briefly in the introductory chapter and Section 2.1.2—provides personal injury coverage to all road users within the borders of South Africa. This statutory body protects accident victims or their families against losses incurred as a result of bodily harm or death. Victims or their relatives may receive compensation for past- and future medical expenses (including rehabilitation), losses of income, losses of financial support (in the event of the death of a breadwinner), funeral costs and non-patrimonial losses (such as suffering and pain) incurred as a result of involvement in an accident which was not the fault of the victim. Additionally, the RAF indemnifies those responsible for accidents against claims relating to the bodily harm or death of the accidents' victims (RAF, n.d.).

The RAF does not provide compensation for the damage or loss of material possessions, including motor vehicles, buildings and vehicle contents. This means that an uninsured driver that causes an accident due to negligent driving would be liable for the property losses incurred by a victim who was not at fault. In South Africa, property coverage is not mandatory and is offered by insurers from the private

sector. Because the majority of drivers in South Africa are uninsured (beyond the scope of the RAF), the likelihood of receiving compensation for property damages when one is involved in an accident caused by the negligence of a third party is concerningly low.

6.2 Shortcomings of the Road Accident Fund's Operating Model

Since the enactment of the Motor Vehicle Insurance Act of 1942—South Africa's first legislation relating to compulsory vehicle insurance—the state's road accident compensation system has undergone numerous significant structural changes, experienced decades of financial instability and been the subject of no fewer than nine commissions of inquiry (RAF, 2020b:20; Vivian & Mushai, 2020). The RAF itself ascribes its long-term financial woes to both the funding- and compensation components of its existing operating model (DoT, 2010; RAF, 2020a,b). As such, each of these core issues is discussed at length. In this section, the financial- and claims data referred to were manually extracted from the RAF's annual reports concerning its financial years between 2001/2002 and 2019/2020.

6.2.1 Challenges Relating to Funding: A Simple Source with Swelling Shortcomings

Because petrol, diesel and biodiesel are labelled as fuel levy goods in the Customs and Excise Act (No. 91 of 1964), they are subject to various taxes (Republic of South Africa, 1964). This PATP taxation—charged on a per-litre basis—includes the general fuel levy, the carbon fuel levy, the customs and excise levy, the RAF levy and the equalisation fund levy (RAF, n.d.). In combination, these taxes represent the fourth largest source of government revenue, trailing behind only income tax, company tax and value-added tax (VAT) (SARS, 2021). The majority of the RAF's income is generated by the ring-fenced RAF levy. Approximately 99.8 percent of the RAF's ZAR 41.2 billion annual income originated from this source in the 2019/2020 financial year (RAF, 2020b:41). On an annual basis, the RAF submits a request to National Treasury for adjustments in the magnitude of the RAF levy based on its cost forecasts for the year ahead, however, these changes are rarely accepted in full (RAF, n.d.). This levy—the second-largest add-on tax to the basic fuel price—was set at ZAR 2.18 per litre for the 2021/2022 financial year (Mboweni, 2021). Because the charges are levied on the sale of fuel, drivers of vehicles with ICEs cannot avoid contributing to the scheme[40]. As such, the fund collects revenue regardless of whether drivers are licenced and irrespective of whether their vehicles are registered and insured against property damages. This makes for an administratively simple- and inexpensive funding approach that removes the need for enforcement and ensures some degree of universal coverage for road users.

Despite amassing this relatively large source of revenue each year, the RAF's financial state has been characterised by burgeoning insolvency—a trend that began in 1981 (RAF, 2020b:20). With the entity's total liabilities exceeding its total assets by more than 30 times, the RAF had amassed an accumulated

[40] The illicit trade of fuel and cross-border refuelling do make avoiding PATP levies possible, however, it is unlikely that these trades would occur on a large enough scale to describe their impacts on the RAF's income as anything other than negligible.

deficit to the tune of ZAR 321.7 billion by the end of the 2019/2020 financial year. While roughly ZAR 40 billion worth of claims were paid out during the same financial year, cash constraints prevented a further 258,382 finalised claims—equivalent to ZAR 14.9 billion in compensation—from being paid out (RAF, 2020b:17). The deteriorating financial state of the entity is apparent in Figure 6.1—an illustration of the deepening deficit stemming from cash constraints, despite annual increases in the per-litre RAF levy.

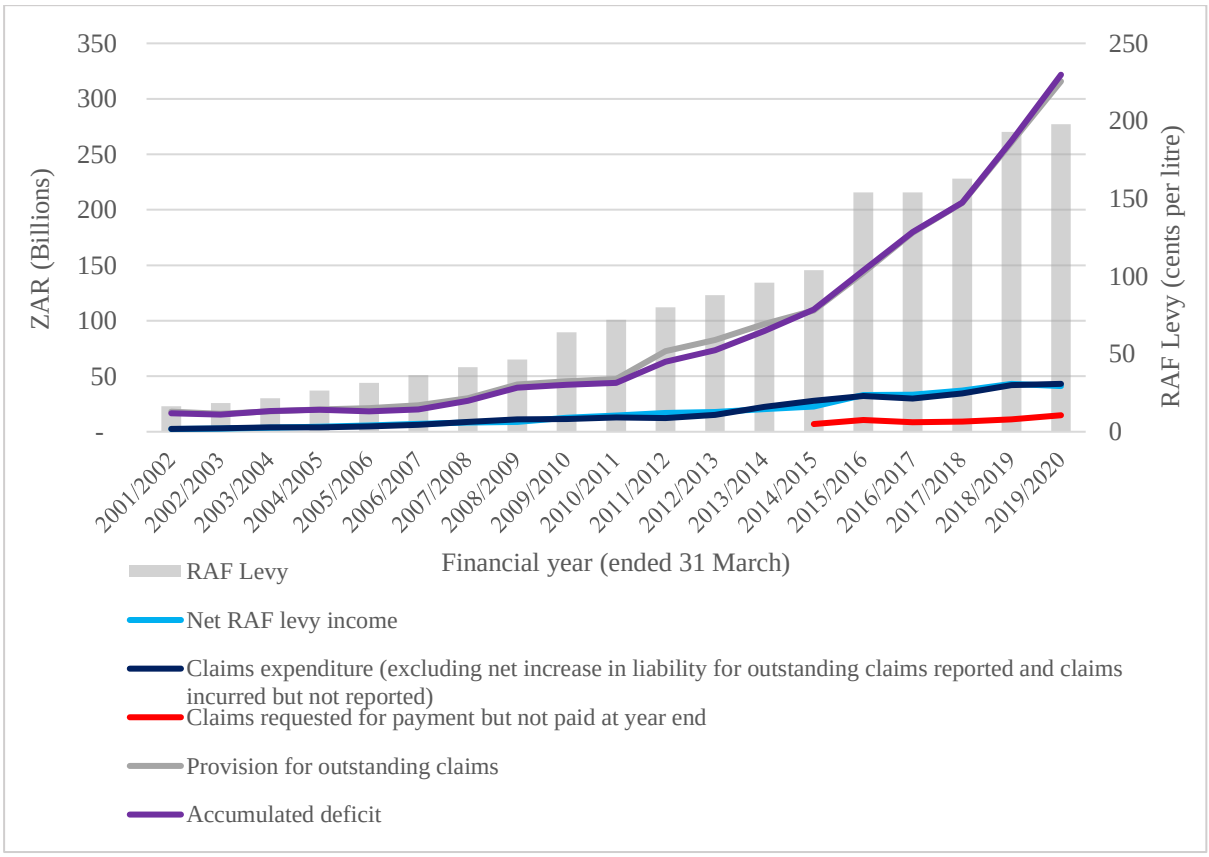

Figure 6.1: Selected financial indicators of the RAF (2001/2002-2019/2020).
(Source: Own calculations from RAF, n.d.)

While PATP charges have a degree of intuitive appeal owing to their simplicity, the RAF faces an array of inherent challenges—of which some are mounting—that relate directly to its reliance upon charges levied on fuel sales. Each of these challenges is discussed below.

6.2.1.1 Improving Vehicle Efficiency and the Adoption of Alternative Means of Vehicle Propulsion

Because the amount of revenue collected by the RAF is inherently hinged upon the nation's combined fuel consumption, technological progress that brings with it improvements in the fuel efficiency of ICE vehicles erodes the fund's income, ceteris paribus. If one ignores other types of technological progress and policy changes that occur simultaneously and have direct bearings on driving safety, this reduction in income would most likely not be met with a reduction in the fund's expenditures. In fact, one might argue that improvements in fuel efficiency could encourage growth in both vehicle ownership and

overall VKT by reducing the costs associated with driving. As a result of general improvements in the fuel efficiency of the nation's vehicle parc, the RAF would collect less income for each VKT on South Africa's roads, ceteris paribus. The funding model of the RAF is hence impaired as a result of a weakening relationship between fuel use and expected RAF claims.

With new vehicles becoming increasingly fuel-efficient over time, it might also be argued that those who cannot afford to replace their ageing vehicles would contribute disproportionately to the RAF—raising questions over the long-term equitability of the existing PATP funding model. Concerns relating to equity would be particularly relevant if the RAF were to attempt to offset this declining yield per VKT with heightened per-litre charges.

Figure 6.2 highlights a general shift towards improved fuel efficiency in new vehicles across both developed- and emerging markets. While not presented graphically, it is worth noting that the observable downward trend in the average fuel consumption of new vehicle registrations in South Africa occurred despite sport utility vehicles (SUVs) constituting a growing share of all passenger vehicle sales over the last decade (Paoli, Teter, Tattini & Raghavan, 2020)[41].

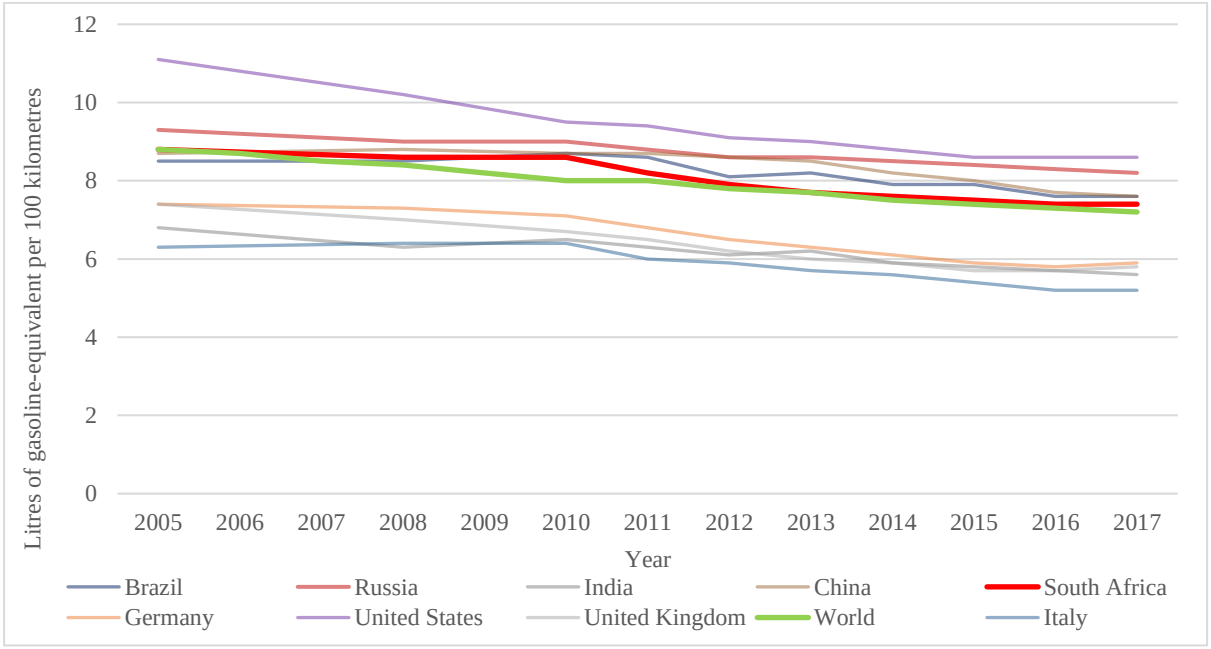

Figure 6.2: Mean fuel consumption of new light-duty vehicle registrations in selected global markets.

(Source: International Energy Agency, 2019:88)

[41] The growing preference for SUVs is also reflected in increases in the average- power, engine displacement and kerb weight of new vehicle registrations in South Africa (International Energy Agency, 2019).

In addition to improvements in the fuel efficiency of pure ICE vehicles, the market penetration of electrified vehicles, such as hybrid electric vehicles (HEV), plug-in hybrid electric vehicles (PHEV) and battery electric vehicles (BEVs), has the potential to place the RAF's financial position under further pressure. Since most hybrid vehicles feature a combination of an ICE and an electric motor, the RAF would still collect some income from drivers of these vehicles, however, the amount obtained per VKT would be less than that obtained if the drivers had equivalent pure ICE vehicles. Because BEVs are entirely free from reliance on petrol or diesel, the RAF would not collect any income from the drivers of these vehicles. In the current overarching insurance arrangement, which does not mandate property coverage, owners of BEVs could hence avoid accident cost internalisation measures altogether.

By 2030, it has been predicted that approximately seven percent of the global vehicle fleet (equivalent to 140 million vehicles) will be comprised of plug-in electric vehicles (i.e., PHEVs and BEVs) if existing government policies are abided by (International Energy Agency, 2020b)—a particularly concerning forecast for entities that rely on charges levied on the sale of fuel. Naturally, the extent- and timeline of the impacts that these types of propulsion technologies will have on the RAF's income will be largely determined by the local market's rate of adoption. Constrained by an array of adoption barriers, only 1,119 plug-in electric vehicles had been sold in South Africa by the end of 2019 (uYilo, 2020). Assuming that all of these vehicles remained registered in December of 2019, this was equivalent to less than 0.015 percent of the total motor car fleet. Among others, adoption barriers faced by plug-in electric vehicles in South Africa include range anxiety, limited charging infrastructure, deterring import duties, restrictive purchase prices and limited options for consumers (Manu, 2019:107). With an average domestic vehicle parc age of ten years (Lamprecht, 2020:16), a fairly gradual vehicle replacement rate may, too, soften this threat over the short- and medium-term. Despite their underwhelming share of the domestic vehicle parc, both the disruptive potential- and the associated impact of electrified vehicles on the RAF's coffers are likely to accelerate with each progressive loosening of these constraints.

6.2.1.2 Fuel Consumption as a Proxy for Risk Exposure

In the current funding arrangement, the per-litre RAF levy would appear to be determined arbitrarily by National Treasury and does not reflect the expected claims expenditures of the entity. While the uniform PATP approach used by the RAF represents a basic attempt to link levies to vehicle usage, its reliance upon fuel consumption as a proxy for risk exposure presents limitations that are rooted in its failure to accurately reflect variation in the risk profiles between drivers. Traditional driver- and vehicle rate factors that have been researched and refined extensively by insurers are ignored entirely or considered only through indirect associations with fuel consumption. It is for this reason that some PATP proponents denounce uniform per-litre charges for all drivers and suggest charging drivers different rates according to traditional rate-making factors (Khazzoom, 2000:16; Sugerman, 1994:365). This would allow drivers with a proven track record of safe driving behaviour to contribute less to the RAF

for each litre of fuel purchased, while those who exhibit risky driving behaviour would face steeper levies.

Furthermore, vehicle parameters and features that affect fuel consumption but have either little- or no direct bearing on accident risk, such as aerodynamic drag, stop-start systems and air conditioner usage, influence drivers' contributions to the fund. The result of this is that equivalently risky drivers with equivalent expected claims could pay different levies. Similarly, relatively risky drivers of fuel-efficient vehicles could contribute less to the fund than risk-averse drivers of less efficient vehicles. Conversely, vehicle features that produce discernible road safety benefits but have either little- or no influence on fuel consumption, such as electronic stability control (ESC) and advanced driver-assistance systems (ADAS), do not influence drivers' contributions to the fund. In other words, drivers with different levels of risk exposure could be charged equally. These statements raise questions over the fairness of the levy, since it is earmarked specifically for the purpose of accident externality internalisation, as well as its ability to encourage desirable driving behaviour by reflecting the user-pays principle.

By default, the RAF collects revenue on the sale of all petrol and diesel. This includes fuel used for both road vehicles and non-road engines (such as vessels, electricity generators, tools, machinery and equipment). Under specific circumstances, commercial users of diesel from certain industries, such as farming, mining, forestry, electricity generation, harbour operations and off-shore activities can receive a refund for their contributions to the RAF (SARS, n.d.), however, refunds are not available on the use of petrol. This implies that certain users of non-road engines with no bearing on road safety whatsoever contribute towards the fund's coffers—perhaps undermining the fairness of the charging mechanism further.

6.2.1.3 Limited Consumer Choice

Because the incumbent RAF is the only organisation that can levy charges on fuel and administer universal coverage, drivers cannot contribute to an alternative fund or insurer that they deem preferable. It might be argued that the fund is more likely to face backlash and public scrutiny because aggrieved drivers cannot simply switch to another insurer.

In many nations with legislation that mandates the purchase of vehicle insurance, vehicle owners have the option to select their policies from an array of approved private insurers. While rules relating to minimum levels of coverage and varying levels of control over pricing are not atypical in these otherwise competitive environments, consumers ultimately have the freedom to select their preferred insurer and policy, and can switch between offerings as they see fit. Exploration of compulsory insurance arrangements beyond South Africa's borders is continued in Section 6.5.

6.2.2 Litigious Claims Environment: Spiralling Costs and Delayed Compensation

The current fault-based system of the RAF requires negligence to be established and apportioned between those involved in accidents. This often involves a costly and prolonged litigation process,

resulting in a considerable share of the RAF's income being diverted towards legal fees rather than reaching accident victims. For instance, between 2013 and 2020, an average of 21.5 percent of the annual revenue derived from the RAF fuel levy was diverted towards the legal costs of claimants and the RAF itself. Over the same period, the entity's legal bill alone exceeded its expenditures for medical treatment by more than three times (RAF, n.d.). Figure 6.3 illustrates the growth experienced in the RAF's main expenditures (i.e., claims paid and legal expenses) and income (i.e., net revenue from the RAF levy) between the 2002/2003 and 2019/2020 financial years. Figure 6.4 shows the proportion of RAF levy income spent on claimants' compensation, medical expenses and legal fees each year between the 2012/2013 and 2019/2020 financial years[42]. When considered in combination, these figures illustrate that, although the RAF's revenues and expenditures have burgeoned of recent, the proportion of fuel levy income ultimately spent on legal fees has remained substantial and relatively consistent[43].

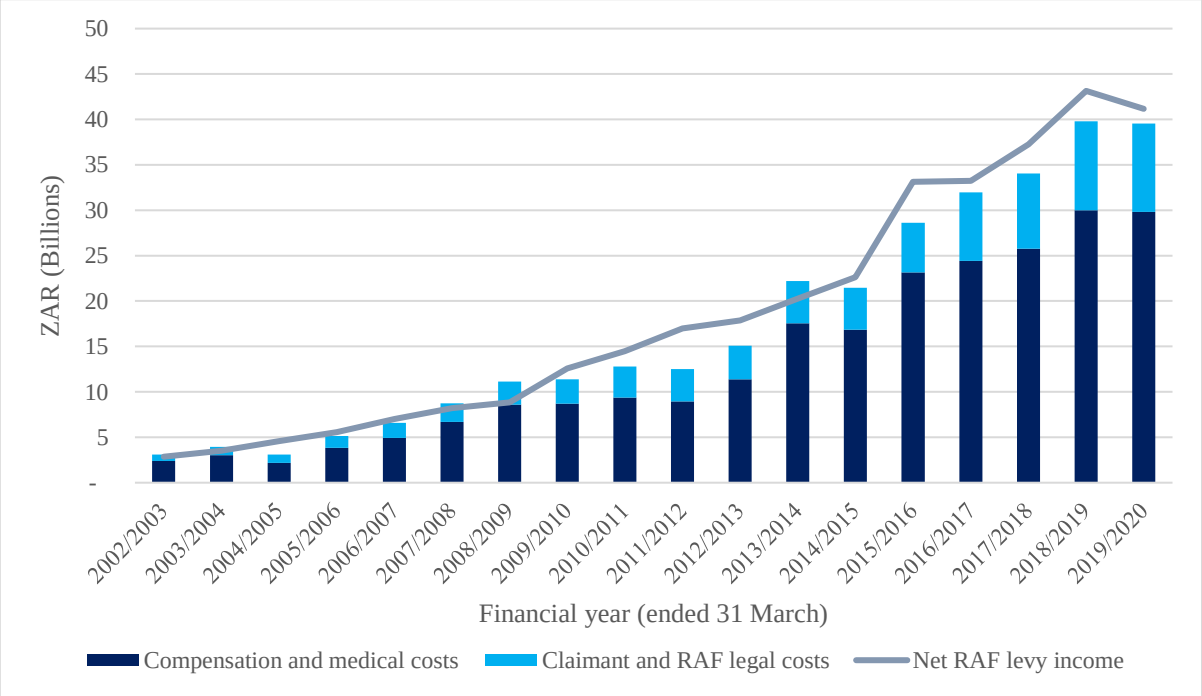

Figure 6.3: Compensation paid and legal costs incurred by the RAF (2002/2003-2019/2020). (Source: Own calculations from RAF, n.d.)

[42] It is worth noting that the sum of the proportions shown in a particular year can exceed 100 percent. This would simply imply that claims expenditures exceeded income from the RAF levy in that year. These additional claims could have, for example, been settled using cash reserves and/or the entity's investment income.

[43] When constructing these figures, all annual financial values were rounded off to the nearest ZAR 1 million. Because some of the annual reports from which the values were derived utilised rounded values, it was deemed appropriate to expand this rounding to all values.

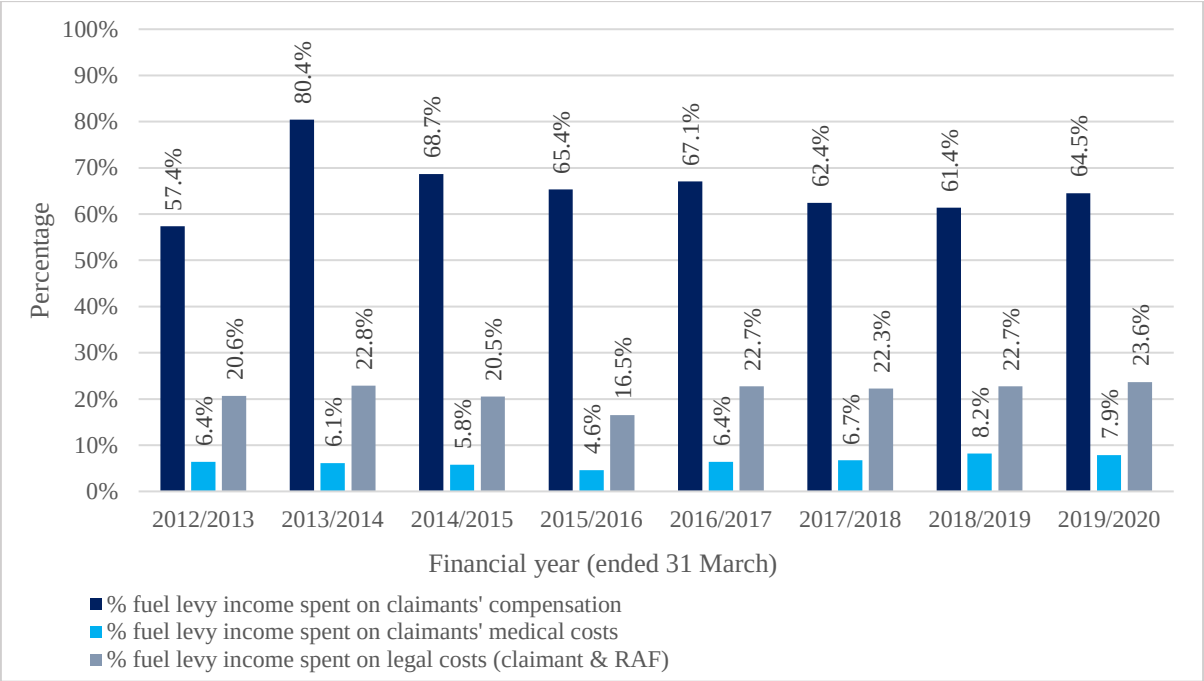

Figure 6.4: Composition of claims paid by the RAF (2012/2013-2019/2020).

(Source: Own calculations from RAF, n.d.)

Faure (2006:153) contends that, given the lack of competitiveness, providing insurance on a collective basis (i.e., through a single entity) may offer inadequate incentives for cost management. Legal practitioners have asserted that the RAF itself is principally responsible for its burgeoning legal expenses by contesting claims that it has little likelihood of winning (Klopper, 2019). A striking statistic illustrates this point—in the 2018/2019 financial year, only 86 of the RAF's 22,366 cases that were allocated court dates actually proceeded to trial (RAF, 2020b:4). This implies that a significant proportion of the litigation costs associated with the remaining cases—which were settled outside of court—could likely have been avoided. After a review of several cases in which judges condemned the RAF's conduct relating to claims, Judge Binns-Ward suggested that the RAF's regular delays in conceding liability were part of an intentional ploy to control its liquidity challenges by postponing inevitable settlements (*Daniels, Sikoti, Sunduzwayo v the RAF, the Minister of Transport, the Chief Executive Officer of the RAF* (WCC) unreported case number 8853/2010 of 28 April 2011). Not only does this litigious tactic incur considerable avoidable costs, but it ultimately prevents deserving claimants from receiving their compensation timeously. At the end of the 2019/2020 financial year, some 91,124 outstanding claims—equivalent to 28 percent of all outstanding claims—had been submitted more than three years prior, despite the organisation aiming for a maximum turnaround time of 120 days (RAF, 2020b:24). Since claimants are not entitled to any compensation prior to reaching a settlement agreement or a positive court outcome, accident victims and their dependents may have to rely on their own resources to pay for timeous medical treatment and rehabilitation. Similarly, victims who cannot return to work immediately may face destitution as a consequence of a loss of income without prompt compensation.

Because of the litigious environment in which claims takes place, it has also been argued that legal complexities elevate the claims process beyond the comprehension of typical applicants (DoT, 2010). As a result, legal representation is often necessitated among accident victims who believe that they deserve compensation. Given the uncertainty of the claims environment, the potential financial burden associated with this representation in the event of a failed- or withdrawn case may discourage accident victims from lodging claims at all.

Given its current operating model, the RAF describes its dispensation as "unreasonable, inequitable, unaffordable and unsustainable" (RAF, 2019:13). Internal mismanagement and maladministration as well as a high prevalence of fraudulent claims have added fuel to fire—plunging the organisation into a seemingly inescapable, liability-ridden financial position (RAF, 2020b). As a result, the DoT made attempts to promulgate an alternative PATP scheme with fundamental changes to the way that claims are made and paid out—known as the RABS. This proposed scheme, which had its progress halted by the National Assembly in 2020, is discussed in greater detail in Section 6.4.

6.3 Hypothecation: Merits and Downfalls

Ring-fencing, *earmarking* or *hypothecating* of a specific tax refers to the designation of its associated revenues to a specified end-use (Newbery & Santos, 1999:104). Since the RAF obtains most of its income from a ring-fenced source, a discussion of the merits and downfalls associated with earmarking is warranted.

Hypothecation is typically described in terms of its *strength* (i.e., the extent to which revenues determine expenditures) and *width* (i.e., how broadly the revenues can subsequently be utilised) (Wilkinson, 1994:125). With approximately 99.8 percent of the RAF's income originating from the RAF PATP levy in the 2019/2020 financial year (RAF, 2020:41) and the majority of this revenue being directed towards claims and their associated delivery costs, this hypothecation can, for all intents and purposes, be described as strong and narrow.

Proponents of hypothecated taxes often justify their stance on the grounds of perceived transparency and accountability (Doetinchem, 2010:4). By ring-fencing the RAF levy, it may be that a more perceptible link exists between the levy and the destination of its associated revenues—ultimately assuring the public that it will serve its intended purpose. This merit arguably bears great weight in the South African context, where the general level of trust in the state is grim (Edelman, 2021). It has also been argued that hypothecation can be used as a tool to rein in wasteful expenditure by constraining the availability of funding (Econex, 2011:2). Moreover, because the revenues from the RAF levy are earmarked for a specific end-use, the RAF does not have to compete for funding with other requests made to National Treasury. Beyond guaranteeing funds for the RAF, this safeguards the organisation against competing political interests and passivity. On balance, these benefits could allay scepticism

held by the public towards the levy while ensuring that funds are available to partially offset accident costs.

Because the RAF's income is hinged upon the nation's combined fuel consumption and is not tied to the funding required for the insurer to fulfil its mandate, it might be asserted that hypothecation could bring about inappropriate levels of funding (Doetinchem, 2010:5)—a theme considered in Sections 6.2.1.1 and 6.2.1.2 The RAF is well accustomed to misalignment between its income and claim liabilities, as reflected in its consistent incurrence of annual deficits. Over time, this imbalance and the inflexibility of strong hypothecation have contributed to the RAF's cash constraints and liability-stricken position. With the extent of the RAF's insolvency deepening consistently from year to year, it might be argued that the merit of hypothecation as a means to combat wasteful expenditures has been somewhat undermined. One might also propose that the dire financial state of the RAF *could* lead the public to consider the levy as a case of throwing good money after bad, which may erode support of a hypothecated levy.

6.4 The Road Accident Benefit Scheme: A Non-Starter

The DoT's proposed replacement for the RAF—the RABS—arose from the need to improve the financial sustainability and efficiency of the state's public road accident compensation scheme while also improving access to medical care for those involved in accidents. The main difference between the current system and its now-quashed replacement was that the RABS would have been a no-fault scheme. As discussed in Section 6.2, the RAF incurs significant legal costs because of the current system's requirement for fault to be established and apportioned between those involved in accidents. By moving to a no-fault system and simplifying the claims procedure, the DoT intended to encourage accident victims to submit claims without legal representation and, as a result of side-stepping litigation, receive compensation expeditiously. In turn, this would allow a greater proportion of revenues derived from the RAF levy to reach accident victims, ceteris paribus.

Another significant difference between the existing scheme and its proposed replacement related to the way that compensation would be paid. In the current system, successful claimants receive their compensation as a single all-encompassing lump-sum payment. Because these lump-sums might include consideration for anticipated future losses, successful claimants often receive compensation for losses that are yet to be realised and that may be subject to change (DoT, 2010:19). Since these claims cannot be re-evaluated after compensation has been paid, it was argued that either under- or over-compensation may occur, which would be detrimental to claimants or the RAF respectively. Had the RABS come to fruition, claimants would have received certain components of their benefits, such as those relating to income losses and dependant support, in the form of periodic payments. These benefits would also have been open to re-evaluation, making the compensation values more adaptable to unforeseen circumstances (DoT, 2010:53). As such, the RABS may have refashioned South Africa's accident

compensation arrangement into one that prioritises treatment and recovery over financial compensation. Moreover, it is possible that spreading compensation across multiple years could have eased the insurer's cashflow challenges and, as a result, allowed a greater number of claimants to receive compensation in a given period.

In August of 2020, more than six years after the publishing of the draft version of what ultimately became the RABS Bill (B17-2017), National Assembly formally rejected the proposed scheme on the back of advice from Parliament's Portfolio Committee on Transport. This decision came amid firm scrutiny of the bill from advocacy groups, opposition political parties and the broader medico-legal fraternity alike. The bill was contested on multiple grounds. The fairness and potential knock-on effects of a taxpayer-funded scheme that would compensate inexcusable wrongdoers, such as those who cause accidents while under the influence of alcohol or drugs, were leading causes for concern. Other prominent criticisms included the cost implications of a no-fault scheme and the injustice of curtailing victims' benefits to reduce the fund's expenditures (APRAV, n.d.; DSC Attorneys, n.d.). Furthermore, because the scheme would have relied on a uniform fuel levy as its principal source of funding, it would not have escaped the intrinsic funding- and incentive flaws of its predecessor. In other words, although a no-fault system may have advanced the organisation's ability to compensate victims timeously, the economic consequences of reckless driving would not have been reflected in motorists' contributions to the insurer. As a result, motorists would still have been presented with an obfuscated economic incentive for improved driving and concerns relating to heightened moral hazard could have materialised.

6.5 In Search of New Directions: Lessons Learnt from International Experiences

With the proposed RABS now formally off the table, the long-term future of the RAF and its role in offsetting accident externalities incurred on South African roads remains uncertain. The RAF has since turned its immediate attention to improving its existing operating model in a strained attempt to stabilise its precarious financial position. To this end, shrinking its legal bill by 75 percent by 2025 and shortening the turnaround time of new claims to within 120 days have become strategic priorities of the entity (RAF, 2020b:4). To contribute towards the attainment of these objectives, the RAF has endeavoured to boost the proportion of direct personal claims and reduce the share of direct personal claims that are ultimately converted to represented claims by simplifying the claims process (RAF, 2020b:61).

In then-Finance Minister Tito Mboweni's 2020 Budget Speech, the idea of compulsory third-party vehicle insurance was mooted as a means to protect the fiscus against the RAF's ballooning liabilities (Mboweni, 2020), however, no further details relating to its potential introduction were provided. As such, no indication was given as to whether this proposed arrangement would mandate coverage against personal injuries alone or also extend to property damage. Similarly, it was not mentioned what role, if any, the RAF would have in the proposed arrangement.

The South African Insurance Association (SAIA)—the representative body of the country's non-life insurance industry—has been a long-time advocate for compulsory third-party vehicle property insurance. The association argues that by broadening the insurance pool, vehicle insurance could be made more affordable and, as a result, contribute towards financial inclusion and economic prosperity. Despite continued advocacy for mandatory insurance, the association contends that its proposals have had their progress hindered by political difficulties (SAIA, 2019:27).

6.5.1 New Zealand: Close Alignment in a Disparate Context

New Zealand's approach to compulsory vehicle insurance, in many ways, resembles that of South Africa. In the Pacific nation's arrangement, all vehicle owners are required to contribute to a state-run insurer known as the Accident Compensation Corporation (ACC). Like South Africa, New Zealand is one of only a handful of nations that levies accident taxes on the sale of fuel. Similar to in South Africa, insurance beyond the scope of the state-administrated fund is not mandated in New Zealand. Because the ACC does not provide any compensation for damages to property, vehicle owners can opt to subscribe to additional policies offered by private insurers that provide either comprehensive- or third-party coverage for property.

While the parallels between the compulsory vehicle insurance schemes of South Africa and New Zealand are apparent, certain noteworthy disparities exist between both the schemes themselves and the contexts in which they operate. For instance, unlike the RAF and like the formerly-proposed RABS, the ACC operates on a no-fault basis. Moreover, the ACC is also responsible for providing coverage against several types of non-vehicular accidents (ACC, n.d.) and, as such, plays a more comprehensive role in the Pacific nation's broader social security system.

In this section of the chapter, several aspects of New Zealand's compulsory insurance arrangement are explored. The section begins with an overview of the ACC's vehicle accident funding model before exploring the costs of this scheme relative to the RAF. Following this, a comparison is made between the claims environments of the ACC and the RAF. This section draws to a close with an outline of some of the recent- and proposed changes to New Zealand's compulsory vehicle insurance environment.

6.5.1.1 Funding Model

New Zealand—like South Africa—makes use of a ring-fenced PATP levy to fund its compulsory vehicle insurance scheme. Revenue from this levy accrues to the Motor Vehicle Account (MVA), which is under the custodianship of the ACC and is used solely to fund activities related to road traffic accident prevention and compensation (ACC, n.d.).

In addition to the NZD 0.06 per-litre PATP levy[44], the ACC levies charges on annual vehicle registration fees. Like the PATP levy, these annual fees accrue to the MVA for ring-fenced purposes. For light

[44] Equivalent to ZAR 0.63 on 28/09/2021 at the nominal exchange rate.

passenger vehicles, these charges vary based on whether a vehicle is fuelled by petrol or diesel. Diesel vehicles are not subject to any PATP taxation, but do face higher annual ACC charges upon registration (ACC, n.d.). In other words, these vehicles are charged purely at a flat rate, meaning that no link exists between usage and charges. Under existing regulations, BEVs, PHEVs and HEVs face the same ACC levy structure as petrol vehicles, meaning that they are inherently either partially- or fully exempt from PATP levies. The decision to implement this exemption was taken by the state in 2016 and represented a deliberate attempt to foster the uptake of electric vehicles (ACC, 2018a:15). If this exemption is extended beyond its expiration date in December 2021, the ACC would likely face the same inherent- and mounting challenges as the RAF as the adoption rate of electric vehicles proliferates.

It is worth noting that mopeds, scooters and motorcycles are subject to significantly higher levies on annual registration to compensate for the heightened risks associated with their use. Despite this higher charging rate, the ACC has estimated that existing revenues accrued from motorcycle registrations fail to cover one-quarter of the costs associated with injuries tied to motorcycle accidents (ACC, n.d.). In effect, the ACC uses funds accrued from other vehicle types to cross-subsidise the provision of coverage for motorcyclists.

6.5.1.2 Cost Comparisons Between Compulsory Schemes in New Zealand and South Africa

During the entity's 2019/2020 financial year, the ACC's MVA earned a combined total revenue of approximately NZD 444 million from PATP levies and levies on registration fees—equivalent to approximately NZD 114 per registered vehicle. When expressed in South African Rands using a period average nominal exchange rate[45], the average revenue earned per vehicle by the MVA was less than one-third of that of the RAF, as presented in Table 6.1. When adjusted to reflect the differences in the purchasing powers[46] of the nations' currencies, the average revenue earned per vehicle is skewed even further—also presented in Table 6.1.

[45] The financial years of the RAF and the ACC do not align. Regrettably, revenue information was unavailable on a monthly basis and, as a result, the income figures of the entities could not be standardised. As a compromise, the average monthly nominal exchange rates between 1 April 2019 (i.e., the start of the RAF's financial year) and 30 June 2020 (i.e., the end of the ACC's financial year) were used to calculate a period average nominal exchange rate covering both entities' 2019/2020 financial years.

[46] 2020 PPP currency conversion rates obtained from the OECD (n.d.) were used for this purpose.

Table 6.1: Revenue comparison between the compulsory vehicle insurance schemes of South Africa and New Zealand.

Value descriptions	ACC MVA	RAF
Revenue (local currency)	NZD 444,000,000	ZAR 41,177,671,000
Average revenue per vehicle (local currency)	NZD 114.00	ZAR 3,572.30
Average revenue comparison based on the nominal exchange rate		
Period-average nominal NZD:ZAR exchange rate (April 2019–June 2020)	NZD 1=ZAR 9.87	
Converted revenue	ZAR 4,380,988,463	ZAR 41,177,671,000
Average revenue per registered vehicle (based on the nominal exchange rate)	**ZAR 1,124.85**	**ZAR 3,572.30**
MVA:RAF average revenue per vehicle (based on the nominal exchange rate)		**1:3.2**
Average revenue comparison based on Purchasing Power Parity (PPP) conversion		
PPP (2020) (local currency unit per USD)	1.445	6.933
PPP-adjusted revenue	USD 307,266,436	USD 5,939,372,710
Mean PPP-adjusted revenue per vehicle	**USD 78.89**	**USD 515.26**
MVA:RAF average revenue per vehicle (nominal exchange rate (PPP-adjusted)		**1:6.5**

(Source: Own calculations from ACC, 2019a; RAF, 2020b)

Table 6.2 provides an illustrative comparison of the annual compulsory insurance costs that individual drivers of equivalent[47] petrol-fuelled vehicles could expect to pay to the RAF and the ACC in South Africa and New Zealand respectively. To make the comparison representative of a large segment of vehicle owners, the average fuel consumption assumed was that of a modern, entry-level petrol-fuelled sedan. Because the ACC's levies feature both fixed- and variable components, the annual levies imposed by the RAF would be lower than those mandated by New Zealand's regulations at low levels of annual VKT. Owing to the RAF levy's larger variable component, a VKT value exists beyond which annual contributions to the RAF would be greater than those required by its counterpart. Because of the extent of the difference between the per-litre charges mandated by the funds, this annual VKT value is relatively low. Naturally, poorer average fuel efficiency would reduce the VKT at which annual contributions to each of the respective funds would be equivalent. As was the case in the previous cost comparison, adjusting these values to reflect the disparity in the purchasing power of the nations' currencies highlights the relatively costly nature of South Africa's RAF levy.

[47] In this context, "equivalent" refers to the type of fuel used as well as the average fuel efficiency.

Table 6.2: Cost comparison between the compulsory vehicle insurance schemes of South Africa and New Zealand.

Value descriptions	Values
Assumed fuel consumption (litres per 100 km)	7.00
Cost comparison based on the nominal exchange rate	
Assumed nominal exchange rate (28/09/2021)	NZD 1 = ZAR 10.52
RAF levy on fuel (per litre)	ZAR 2.18
ACC levy on fuel (per litre)	ZAR 0.63
Annual ACC Levy on vehicle registration fees[48]	ZAR 484.34
Annual VKT at which contributions to each scheme would be equivalent	4,467.43
Total annual levies for either scheme at the above VKT	ZAR 681.73
Total annual RAF levies associated with driving 12,000 VKT	ZAR 1,831.20
Total annual ACC levies associated with driving 12,000 VKT	ZAR 1,014.55
Cost comparison based on Purchasing Power Parity (PPP) conversion	
PPP conversion rate (2020) (ZAR per USD)	6.933
PPP conversion rate (2020) (NZD per USD)	1.445
PPP-adjusted RAF levy on fuel (per litre)	USD 0.31
PPP-adjusted ACC levy on fuel (per litre)	USD 0.04
PPP-adjusted annual ACC Levy on vehicle registration fees[49]	USD 31.86
Annual VKT at which contributions to each scheme would be equivalent	1,667.79
Total annual levies for either scheme at the above VKT	USD 36.71
Total annual PPP-adjusted RAF levies associated with driving 12,000 VKT	USD 264.13
Total annual PPP-adjusted ACC levies associated with driving 12,000 VKT	USD 66.74

(Source: Own)

6.5.1.3 Contrasting Claims Environments

Despite the no-fault nature of the ACC making its claim requisites less restrictive than those of the RAF, the entity has consistently recorded significantly fewer claims relating to road accidents per annum than the RAF. On average, the RAF received approximately six times as many annual road accident claims as the ACC between the 2010/2011 and 2019/2020 financial years. Even when the large disparity in the size of the nations' vehicle fleets is accounted for, the average number of annual road accident claims received by the RAF was more than double that of the ACC. Figure 6.5 compares the number of claims

[48] Goods and Services Taxes (GST) were excluded from this calculation.

[49] Goods and Services Taxes (GST) were excluded from this calculation.

received annually—expressed on a per 10,000 registered vehicles basis—by the two nations' road accident compensation schemes between 1 April 2010 and 31 March 2020.

It is probable that the disparity in claims is largely underpinned by considerable differences in the nations' road safety records. While a lack of data relating to non-fatal accidents in South Africa makes quantifying this assertion challenging, a comparison between the nations' annual road accident mortality rates demonstrates a stark gulf between their road safety outcomes—evident in Figure 6.6.

In addition to the differences in the claims volumes faced by the RAF and the ACC, the nations' accident compensation entities differ in the format of their pay-outs. In New Zealand, claimants receive part of their compensation—such as that which relates to lost wages—in the form of periodic payments (Community Law, n.d.). This approach has a greater degree of flexibility than that of the RAF and ensures that accident victims are supported financially until they re-establish vocational independence.

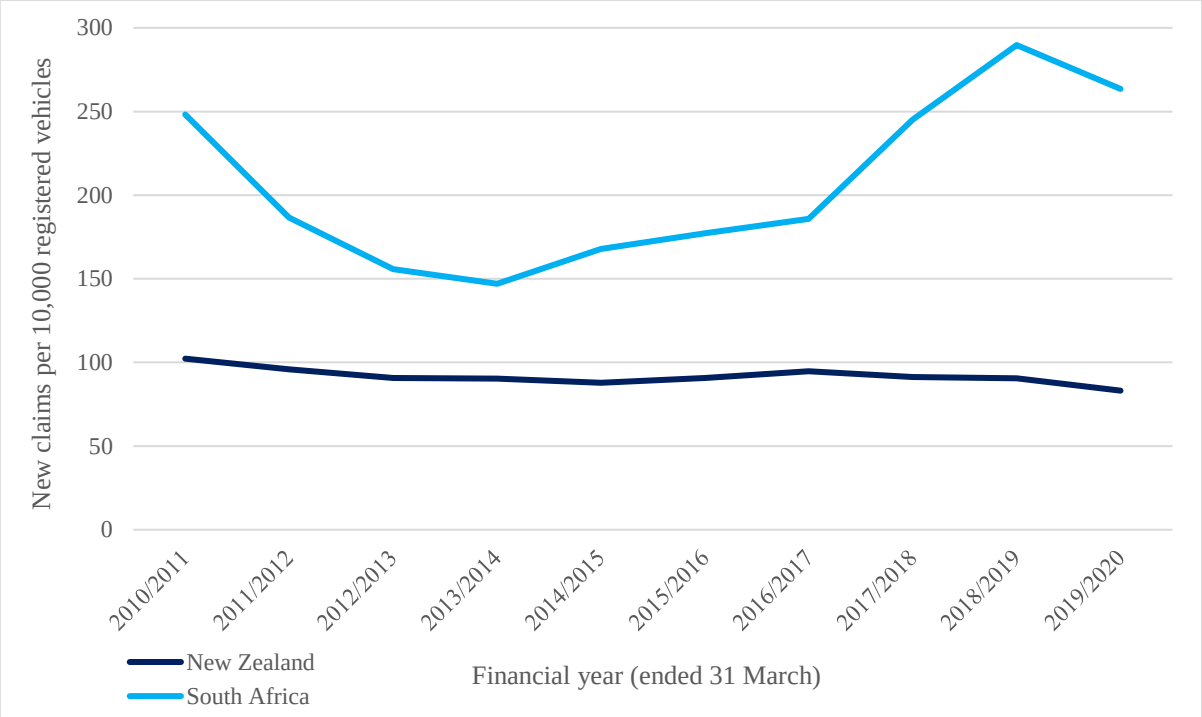

Figure 6.5: Number of annual claims (per 10,000 registered vehicles) relating to road accidents received by the RAF and ACC (2010/2011-2019/2020).

(Source: Own calculations from eNaTis, n.d.; Ministry of Transport, 2021; New Zealand Government, 2020; RAF, n.d.)

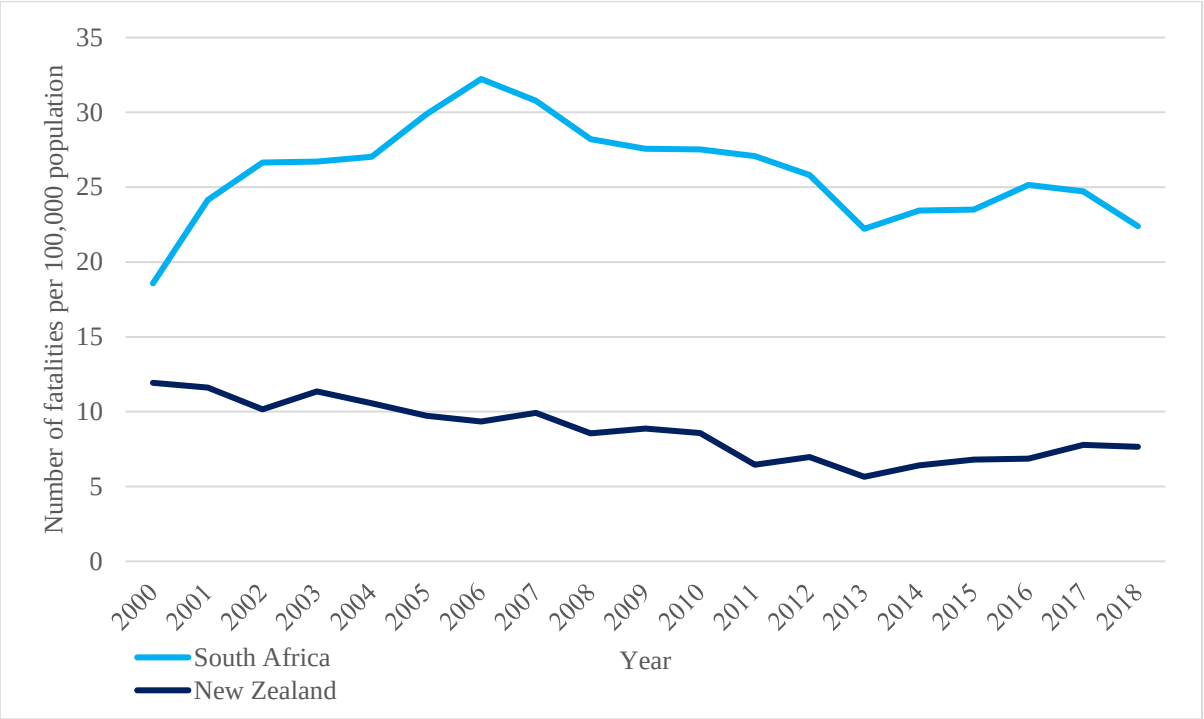

Figure 6.6: Road accident fatalities (per 100,000 population) in South Africa and New Zealand (2000-2018).

(Source: Own calculations from (Arrive Alive, 2001; Ministry of Transport, n.d.; OECD, 2021; RTMC, n.d.; Stats NZ, n.d.)

6.5.1.4 Compulsory Third-Party Property Insurance

While third-party coverage relating to motor vehicle injuries has been mandatory in New Zealand since 1928[50] (ACC, n.d.), no regulation has mandated vehicle property damage insurance in the country (New Zealand Government, 2008). Without universal third-party coverage against property damages, it is possible that innocent accident victims could have to foot the bill for damage to their own property. Even among innocent accident victims with comprehensive coverage, the recovery of one's excess from uninsured at-fault drivers is not guaranteed[51].

In mid-2008, the Ministry of Transport signalled its interest in implementing a mandatory third-party property damage scheme and launched a project to explore public perceptions of the proposal. In this potential arrangement, the ACC would remain responsible for compensation relating to injuries, while private insurers would cover vehicles for property damages only. The intention behind this scheme was

[50] The Motor Vehicles Insurance (Third Parties Risk) Act was enacted by the state in 1928. This was subsequently replaced by the Accident Compensation Act in 1972. In 1974, the ACC was established as the custodian of the state's insurance scheme (ACC, n.d.).

[51] Most providers of comprehensive coverage provide limited protection for innocent parties against at-fault uninsured drivers, provided that the driver can be identified. This extension typically covers the excess and keeps policyholders' no-claims records in tact (Insurance Council of New Zealand, n.d.).

to safeguard at-fault drivers against financially ruinous liability as well as prompt drivers—particularly those from the younger segment—to bear responsibility for their driving behaviour (New Zealand Government, 2008). As part of this consultation process, the state commissioned two consecutive surveys—with sample sizes of 1,000 and 4,000 respectively—aimed at estimating the proportion of uninsured vehicles in the country's vehicle parc. The results of these surveys indicated that more than 92 percent of privately-owned vehicles had some form of coverage against property damages (i.e., either comprehensive- or third-party coverage) (Ministry of Transport, 2009:2). Another nationally representative survey undertaken in 2020 has since corroborated this finding (Finder NZ, 2020). This juxtaposes starkly with the South African setting, in which up to 70 percent of registered vehicles remained uninsured in mid-2018 (AA, 2018). Even in nations with longstanding compulsory third-party property insurance arrangements and strong enforcement thereof, like the United Kingdom, compliance is not universal. As a result of New Zealand's near-universal rate of voluntary coverage, the potential benefits of compulsion were deemed to be of a lesser extent than anticipated (New Zealand Government, 2010). The costs needed to bring about marginal improvements in this rate through compulsion, such as those linked to enforcement, would also have been significant. Simply put, the costs of compulsion could either have outweighed- or largely offset the potential benefits of an arrangement of this nature and, as a result, the scheme failed to gather momentum.

Under the existing regulations, insurers are not compelled to cover vehicles belonging to drivers that they expect to be unprofitable (Heath, 2019). By mandating third-party property coverage, insurers may have become obliged to accept these particularly high-risk drivers, which could have, in turn, prompted them to inflate the costs of coverage among all other drivers. By raising the costs of coverage, compulsion may have discouraged compliance and, as a result, inadvertently reduced the proportion of insured vehicles on New Zealand's roads by making coverage unaffordable. Given that unaffordability emerged as the leading reason for owning an uninsured vehicle in the Ministry of Transport's (2009:5) investigation of the insurance market, the potential for heightened average premiums would have been of concern to the state.

6.5.1.5 Vehicle Risk Rating

Between 2015 and mid-2019, when the nation was governed by a National Party-led coalition, the ACC levies on vehicle registration fees were differentiated to include consideration for variation in vehicles' relative levels of safety. Light passenger vehicles were categorised into four bands—each with different levies—based on crash test performance scores and attributes like age, size and type. Without this differentiation, it was argued that owners of relatively safe vehicles would cross-subsidise owners of less-safe vehicles (Ministry of Business, Innovation & Employment, 2018:5). As such, by allowing injury risk to be better reflected in motorists' levies, this adjustment arguably corroborated the user-pays principle in an improved manner. It was proposed that this differentiated approach would also encourage greater consideration for safety in vehicle purchase decisions and hasten the pace at which less-safe

vehicles would be removed from the nation's vehicle parc. Critics of this approach argued that the alteration to the incentive structure would not be sufficient to entice purchases of safer vehicles, given the size of the potential savings relative to the purchase price of new vehicles (Duncan, 2019:266). Concerns were also raised over the equitability of an approach that would be regressive in nature by putting individuals from relatively low-income backgrounds, who owned a disproportionate share of less-safe vehicles, under greater financial pressure (ACC, 2019b). On the back of little evidence of an accelerated removal of unsafe vehicles from New Zealand's roads, the then-Labour-led coalition government removed vehicle risk rating from the ACC levy on registration fees from mid-2019 onwards (Ministry of Business, Innovation & Employment, 2019:3).

6.5.1.6 Future Funding Arrangements

Although the MVA currently relies on a PATP levy similar to that of the RAF as a primary source of funding, the ACC has expressed interest in adopting alternative funding methods that better reflect drivers' usage and risk. While proposals to date have been vague, the ACC has indicated that distance-based charges will receive consideration (ACC, 2018a:16). In addition to acknowledging the inherent flaws of its PATP revenue stream, the state-run insurer has started to re-evaluate its annual charges on vehicle registration fees. During the entity's 2016 levy consultation, the ACC began a public participation project to gauge stakeholders' perceptions of a distance-based ACC levy as a replacement for the annual levy on registration fees, with specific reference to non-petrol vehicles (ACC, 2018b:34). As already mentioned, diesel vehicles are not subject to PATP levies under the existing regulations and, instead, face annual levies of a larger magnitude than petrol vehicles upon registration. According to the ACC, diesel vehicles are exempt from PATP charges because diesel is commonly used for non-road purposes (ACC, n.d.), such as fuelling agricultural equipment and vessels. While there is merit in exempting non-road engines from hypothecated charges relating to road accidents, applying a universal PATP exemption to all diesel vehicles and attempting to recuperate the forgone ACC income with an inflated lump-sum charge appears somewhat inordinate[52] and fails to offer an incentive for improved driving behaviour. Figure 6.7 highlights the growing prominence of diesel vehicles within New Zealand's national parc. Given that these vehicles—particularly those from the light commercial category—have occupied an increasingly prominent role within New Zealand's vehicle parc over the last two decades (Ministry of Transport, n.d.), the annual flat-rate charge should be of growing concern to the ACC. The entity has also recognised that these lump-sum charges make coverage costly for owners of multiple vehicles (ACC, 2018a:16).

[52] It is worth noting that diesel is also exempt from the PATP National Land Transport Fund fuel tax—the largest add-on to the basic fuel price in New Zealand. Instead, operators of diesel vehicles and all vehicles with a gross laden weight in excess of 3.5 tonnes must pay distance-based road user charges to the National Land Transport Fund (NZ Transport Agency, n.d.). These distance-based charges do not include any contributions to the ACC.

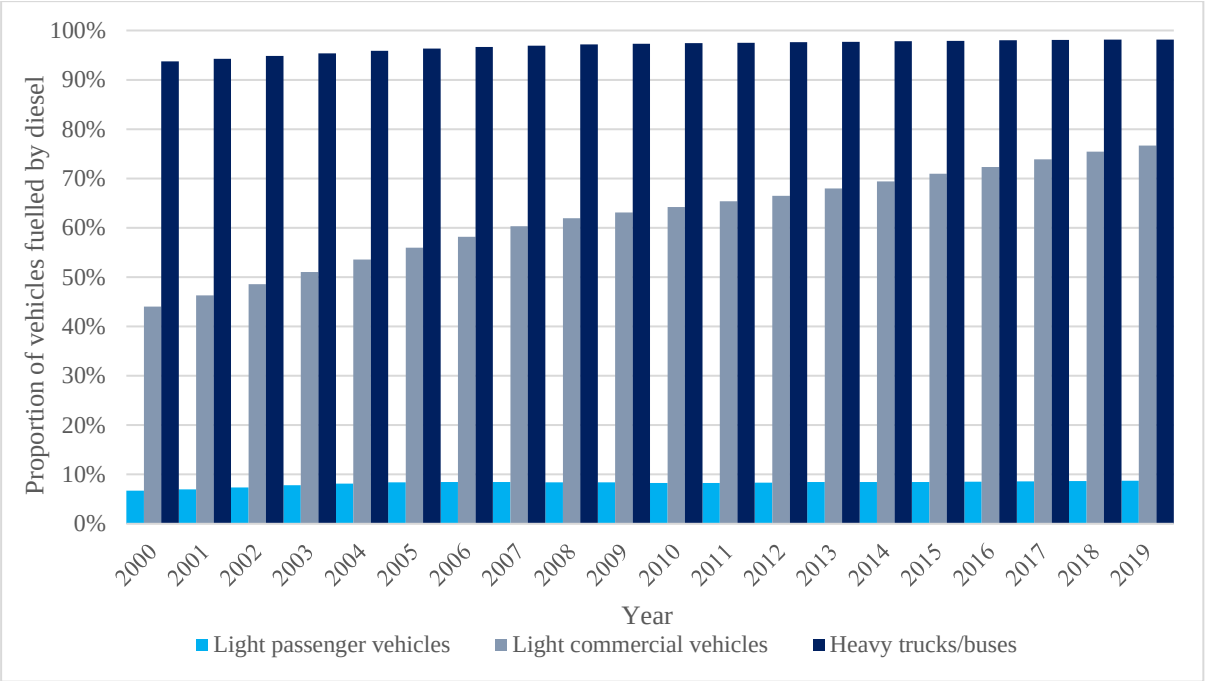

Figure 6.7: Proportion of New Zealand's vehicle parc fuelled by diesel (per vehicle type) (2000-2019).

(Source: Ministry of Transport, n.d.)

6.5.2 China: Awakening the Sleeping Giant's Insurance Industry Through Marketisation

Under the sway of the Soviet Union, motor insurance products were eliminated entirely in China between the 1950s and 1980s, supposedly over concerns relating to the moral hazard that they might have posed (Yan, 2018:233). The re-introduction- and subsequent dismantling of a state-owned monopoly on insurance coincided with rapid economic growth in the nation, creating a conducive environment for the uptake of both private vehicles and associated coverage in the late 1980s (Yan, 2018:234; Yan & Faure, 2020:61). Since then, the Chinese market for vehicle insurance has become the second-largest globally[53], trailing behind only that of the United States (Jiang, Jiang & Gu, 2020:35). With the per capita vehicle ownership rate of China being less than one-quarter of that of the United States in 2020 (Jiang *et al.*, 2020:8), noteworthy potential appears to exist for further growth in the nation's vehicle insurance market.

In line with the practices of most of the world, China makes use of compulsory MTPL to ensure that motorists have some degree of protection against third-party claims. Optional commercial insurance exists to offer motorists expanded coverage. China's arrangement is somewhat unique in that motorists'

[53] Measured in terms of GWP.

mandatory- and commercial policies are handled independently of each other[54], despite both types of policy being provisioned by the private sector.

MTPL was made mandatory at a national level by the Chinese state in 2003 as part of the nation's overarching laws on road traffic safety[55]. Despite this requirement, compliance and enforcement were found wanting and less than 40 percent of all motor vehicles (including motorcycles and certain agricultural vehicles) were covered by the end of 2005 (Yan & Faure, 2020:72). In mid-2006, the uptake of MTPL was boosted by the enactment of the *Regulations on the Compulsory Insurance of Motor Vehicle Traffic Accident Liability* and the strict enforcement thereof. By the end of 2018, 95 percent of motor cars were covered[56] (Jiang *et al.*, 2020:72; Yan & Faure, 2020:5). Per these regulations, motorists must purchase this compulsory MTPL from their choice of approved insurers.

Although compulsory MTPL insurance in China is provisioned by the private sector, strict state regulations are imposed on premiums[57], bounds on liability[58] and the bonus-malus system[59] used to determine the sizes of discounts or surcharges upon the annual renewal of insurance contracts[60]. As a result, insurers have limited scope for distinguishing between the risk levels of motorists (KPMG, 2013:6), which may raise issues relating to adverse selection and moral hazard (Yan & Faure, 2020:73).

The standard annual base premium rate for mandatory insurance is determined by the China Banking and Insurance Regulatory Commission (CBIRC) and is currently set at CNY 950[61] (Wang, 2021). This base premium rate is set in accordance with the principle of "no profit, no loss" for insurance undertakings. Insurers can adjust this tariff upwards or downwards to reflect motorists' claims histories, however, the freedom to do so is limited and premiums must remain within a pre-defined range. As

[54] This differs from the MTPL arrangements of EU Member States, for example, in which motorists select a single policy that either meets- or exceeds the mandated minimum levels of coverage.

[55] Per Article 17 of the Law of the People's Republic of China on Road Traffic Safety (Order of the President No. 8) (People's Republic of China, 2003).

[56] Compliance was still, however, significantly lower among owners of motorcycles and tractors (Yan & Faure, 2020:72).

[57] Per Article 6 of the Regulations on the Compulsory Insurance of Motor Vehicle Traffic Accident Liability (People's Republic of China, 2006).

[58] Per Article 23 of the Regulations on the Compulsory Insurance of Motor Vehicle Traffic Accident Liability (People's Republic of China, 2006).

[59] In the context of insurance, a bonus-malus system refers to the mechanism used by insurers to adjust policyholders' premiums based on their claims histories.

[60] Per Article 8 of the Regulations on the Compulsory Insurance of Motor Vehicle Traffic Accident Liability (People's Republic of China, 2006).

[61] Equivalent to ZAR 2,223 on 28/09/2021 when converted using the nominal exchange rate.

such, insurers have limited potential to use tariffs as a means to incentivise improved driving behaviour among policyholders.

To ensure that all drivers can obtain coverage, regardless of their level of risk, insurance undertakings are obliged to accept all requests for compulsory coverage made by motorists[62]. Given the level of state control over tariff-setting, the obligation to contract with high-risk motorists may represent a cause for concern among insurers and, as a result, participation within the compulsory MTPL market may be discouraged.

In the event of an accident, the provider of state-mandated MTPL insurance provides compensation for claims relating to injury (or death), medical expenses and property damages, however, relatively low upper limits on compensation mean that insured drivers are often still exposed to accident costs. To illustrate this point, Yan & Faure (2020:75) turned to the 2013 claims data of a local insurer, which indicated that 26 percent- and 31 percent of claims relating to medical expenses and property damages respectively exceeded the thresholds of the compulsory MTPL programme.

Because of the relatively low upper bounds on coverage—presented in Table 6.3—motorists can opt to take out commercial MTPL insurance over and above the mandated MTPL insurance. These optional MTPL policies have become somewhat less regulated than the mandated policies, and insurers have some degree of freedom to determine tariffs, employ deductibles and apply their own bonus-malus schemes. Unlike China's compulsory MTPL insurance, commercial MTPL insurance operates on an at-fault basis[63]. Because of these features, optional insurance arguably counteracts the challenges relating to moral hazard and adverse selection caused by the strict control over compulsory policies. While it was estimated that more than 82 percent of China's motorcar parc was covered by optional insurance in 2018 (Jiang *et al.*, 2020:5), this proportion varied significantly across regions with different levels of wealth (Yan & Faure, 2020:77). As such, the challenges posed by the state's control over compulsory insurance are only partly offset by optional insurance.

In instances wherein the compensation provided by both compulsory- and commercial MTPL insurance is not sufficient to compensate the accident victim adequately, the tortfeasor is required to pay the outstanding compensation in accordance with the nation's tort liability laws[64]. In the event of insufficient coverage by the wrongdoer's insurer, the existence of a state-established social relief fund ensures that

[62] Per Article 10 of the Regulations on the Compulsory Insurance of Motor Vehicle Traffic Accident Liability (People's Republic of China, 2006).

[63] While the nation's compulsory MTPL insurance is a no-fault system, the liability limits for property damages, personal injuries and death are influenced by whether the insured motorist was at fault (CBIRC, 2020).

[64] Per Article 16 of the Interpretation of the Supreme People's Court on Several Issues Concerning the Application of Law in the Trial of Road Traffic Accident Damage Compensation Cases (Supreme People's Court of the People's Republic of China, 2012).

pressing medical- and funeral expenses that relate to road accidents can be covered. These expenses can subsequently be recovered from the wrongdoer by the fund's administrator[65]. Yan & Faure (2020:79) argue that China is overly dependent on its tort system for the compensation of accident victims and highlight that, on average, less than 71 percent of compensation is paid by MTPL providers in the event of road accident fatalities. While the majority of claims are settled without the need for court proceedings (Yan & Faure, 2020:87), accident victims who do initiate claims in court may not receive timeous compensation. In addition to concerns over the timing of compensation, accident victims may be inadequately compensated in the event of a wrongdoer with insufficient liability coverage being insolvent.

In addition to ensuring that accident victims have immediate access to funds for medical care when the coverage limits for mandatory MTPL are exceeded, the state's road accident social relief fund covers all- or part of victims' pressing medical- and funeral costs when wrongdoers are either unidentified or uninsured[66]. This fund is financed from various sources, including taxes imposed on mandatory vehicle insurance and fines levied against uninsured motorists[67].

Over the last decade, the Chinese state has implemented a suite of market-oriented reforms relating to both compulsory- and optional vehicle insurance. These reforms have handed a slightly greater degree of pricing responsibility to insurers and encouraged foreign participation within the domestic market. Although the Chinese vehicle insurance market remains relatively immature and tightly controlled, these reforms have aligned the domestic market more-closely with those of the developed world.

In 2012, a revision of the state's regulations on mandatory MTPL insurance allowed foreign undertakings to enter the market for the first time (Swiss Re, 2018:10). While foreign insurers could provide optional coverage prior to this amendment, their policyholders would need to turn to domestic insurers to obtain the necessary compulsory coverage. From a consumer convenience perspective, it was argued that the existing protectionist regulation gave local insurers all but absolute control over the market (Shen & Takada, 2012). As such, even though providers of compulsory MTPL insurance have to operate according to the "no profit, no loss" principle and are obliged to contract with high-risk motorists, these policies serve as a proverbial gateway to the potentially-profitable optional insurance

[65] Per Article 75 of the Law of the People's Republic of China on Road Traffic Safety (Order of the President No. 8) (People's Republic of China, 2003) and Article 24 of the Regulations on the Compulsory Insurance of Motor Vehicle Traffic Accident Liability (People's Republic of China, 2006).

[66] Per Article 75 of the Law of the People's Republic of China on Road Traffic Safety (Order of the President No. 8) (People's Republic of China, 2003) and Article 24 of the Regulations on the Compulsory Insurance of Motor Vehicle Traffic Accident Liability (People's Republic of China, 2006).

[67] Per Article 25 of the Regulations on the Compulsory Insurance of Motor Vehicle Traffic Accident Liability (People's Republic of China, 2006).

sub-market. By the end of 2016, 60 insurers were involved in the provision of compulsory MTPL insurance in China, of which 14 were not of Chinese origin (Deloitte, 2018:5).

In addition to allowing foreign participation in the compulsory vehicle insurance market, the Chinese state has made attempts to de-tariff the premiums of commercial insurance policies. The most recent of these efforts took place in mid-2016—giving insurance undertakings a greater degree of control over the premiums levied on optional vehicle insurance (Swiss Re, 2018:8). Prior to this de-tariffication, commercial insurance premium rates were largely uniform—a tactic employed by the Chinese state to ward off ruinous price competition within the industry (KPMG, 2013:6). As in the case of the compulsory MTPL, this gave insurers little reason to implement techniques for granularly discerning between the risk profiles of motorists and limited insurers' ability to incentivise desirable driving behaviour. Contrarily, granting insurers the freedom to levy premiums in a manner that reflects policyholders' risk levels would provide insurers with a basis for the introduction of UBI in the Chinese market (International Transport Forum, 2019).

In the 3rd quarter of 2020, a set of new regulations with noteworthy impacts on the country's vehicle insurance market—known as the *Guiding Opinions on Implementing Comprehensive Reform of Auto Insurance* (*Guiding Opinions*, for short)—was issued by the CBIRC. To achieve the overarching objective of this reform, which was to "protect the rights and interests of consumers", the CBIRC set out to reduce the costs of mandatory coverage, expand mandatory coverage and ultimately improve the quality of vehicle insurance products on offer in the nation (CBIRC, 2020).

As presented in Table 6.3, the Guiding Opinions required significant increases in the coverage levels provided by compulsory MTPL insurance. This adjustment to the coverage levels—the first of its kind since 2008—aimed to narrow the often-large gap between mandatory coverage and accident liability costs (Jiang *et al.*, 2020:5) and, in doing so, provide all motorists with a greater degree of protection against potential insolvency.

Prior to the implementation of the Guiding Opinions, insurers could deviate from the standard mandatory insurance premium rate by no more than 30 percent to reflect the claims histories of policyholders. Per the Guiding Opinions, the allowable downward adjustment was expanded to 50 percent (for motorists with at least three consecutive years of claims-free driving), while the allowable upward adjustment remained unchanged (CBIRC, 2020). This meant that drivers with desirable claims histories could benefit from more-discounted premiums than before, giving them a greater incentive to adopt safe driving behaviour. In addition, to improve fairness and reduce cross-subsidisation between policyholders, the Guiding Opinions amended the bonus-malus system to reflect imbalances in the claims propensities of different regions (CBIRC, 2020).

Table 6.3: Recent changes to the limits on mandatory vehicle liability coverage in China.

Type of claim:	Upper limits prior to September 2020:	New upper limits (since September 2020):
When the insured motorist is not at-fault:		
Injury/Death	CNY 11,000 (ZAR 25,740)	CNY 18,000 (ZAR 42,120)
Medical Expenses	CNY 1,000 (ZAR 2,340)	CNY 1,800 (ZAR 4,212)
Property Losses	CNY 100 (ZAR 234)	CNY 100 (ZAR 234)
Total	CNY 12,100 (ZAR 28,314)	CNY 19,900 (ZAR 46,566)
When the insured motorist is at-fault:		
Injury/Death	CNY 110,000 (ZAR 257,400)	CNY 180,000 (ZAR 421,200)
Medical Expenses	CNY 10,000 (ZAR 23,400)	CNY 18,000 (ZAR 42,120)
Property Losses	CNY 2,000 (ZAR 4,680)	CNY 2,000 (ZAR 4,680)
Total	CNY 122,000 (ZAR 285,480)	CNY 200,000 (ZAR 468,000)
Nominal exchange rate used for conversions (CNY:ZAR): CNY 1= ZAR 2.34		

(Source: CBIRC 2020)

In addition to the reforms on mandatory insurance, the Guiding Opinions endeavoured to enhance the commercial vehicle insurance products on offer within the nation and support the insurance industry in the development of "innovative" products, including UBI (CBIRC, 2020). While no specific course of action relating to this commitment was provided, the Guiding Opinions hinted that intensified competitive pressures would play a prominent role in incentivising innovation among insurers. For example, the new regulations required commercial insurers to increase their expected loss ratios[68] from 65 percent to 75 percent and reduce the upper bound of their expense ratios[69] from 35 percent to 25 percent for all commercial vehicle insurance products (CBIRC, 2020). In response to these requirements, one might expect insurers to employ a combination of increasingly competitive pricing and intensified efforts to boost direct sales through telesales and online platforms, for example. These approaches may allow insurers to trim their expenses by limiting their reliance on brokers while gaining competitive advantages relating to price and convenience. Over the long-term, however, it has been predicted that competitive pressures brought about by the Guiding Opinions will encourage a greater degree of product differentiation and specialisation within the vehicle insurance market—potentially in the form of UBI (Jiang *et al.*, 2020:34).

[68] The l*oss ratio* refers to the losses (i.e., insurance claims and adjustment expenses) incurred by an insurer as a proportion of the premiums it collected (Investopedia, n.d.).

[69] An insurer's *expense ratio* refers to the costs linked to the underwriting of insurance as a proportion of the associated net premiums. These costs might, for example, include broker commissions and advertising expenditures (Investopedia, n.d.).

6.5.3 Compulsory Insurance in the European Context

MTPL insurance is mandatory for all vehicles in all EU Member States as well as in almost all of the countries that constitute the European Economic Area (EEA). In the EU, MTPL insurance provides coverage against the legal responsibility for bodily harm and/or damage to property inflicted upon another as a result of a vehicle-related accident (The European Parliament and the Council of the EU, 2009). This widespread compulsion was largely the result of regulations enacted by the European Commission that aimed to harmonise vehicle insurance within the EU. This harmonisation would play a critical role in facilitating the free movement of individuals between Member States—a core objective of the EU—by removing the need for time-consuming insurance checks when motorists travelled between countries (Gönülal, 2009:190).

6.5.3.1 The Motor Insurance Directive and Green Card System

The MTPL landscape within the EU has been somewhat evolutionary in nature. Between 1972 and 2005, a total of five directives relating to MTPL insurance have been issued by the Council of the EU (Council of Bureaux, n.d.). These directives were ultimately codified—culminating in the 2009 Motor Insurance Directive (MID)[70]. Per the MID, EU Member States are required to mandate coverage relating to personal injuries of at least EUR 1,000,000 per victim or EUR 5,000,000 per claim (regardless of the number of victims). For property damages, Member States must mandate coverage of at least EUR 1,000,000 per claim (regardless of the number of victims)[71].

While the MIDs delivered a greater degree of uniformity between the insurance arrangements of EU Member States, efforts to promote convenient travel between nations within the continent were first effected in 1949 and came in the form of the Green Card system—an initiative of the United Nations Economic Commission for Europe (Council of Bureaux, n.d.). In addition to enabling the movement of motorists across borders, the Green Card system aimed to facilitate the settlement of third-party claims against foreign motorists (Council of Bureaux, n.d.). This programme necessitated the establishment of national organisations, which came to be known as National Insurance Bureaus (NIBs), that served as central contact points in each participating state through which accident victims could institute claims against the insurers of foreign motorists (Gönülal, 2009:191). In this system, motorists from participating nations would receive a *Green Card Certificate* from their insurer (or broker). When travelling internationally to a participating nation, this certificate served to verify that drivers had, at the least, the minimum third-party coverage mandated by the host nation. This would indicate that the relevant insurance undertaking would honour third-party claims relating to their policyholders beyond the borders of their usual nation of residence (Gönülal, 2009:192). While the Green Card system is still

[70] Formally known as the Council Directive 2009/103/EC.

[71] The minimum amounts covered by MTPL insurance are stipulated in Article 9 of the MID (European Parliament and the Council of the European Union, 2009).

operational and currently involves the participation of 48 nations, a multilateral agreement and the enactment of the MID have since removed the requirement for motorists from 35 of these nations to utilise the certificate when travelling amongst the states (Council of Bureaux, 2008).

In addition to promoting convenient continental travel among the Member States, the MID sought to expand the protection offered to motorists by the Green Card system and ensure that accident victims would have access to comparable treatment regardless of the accidents' locales. It achieved this by mirroring the Green Card system (Council of Bureaux, n.d.), which was implemented principally to protect victims of accidents in their *own* countries caused by foreign drivers. In other words, the MID would protect motorists while travelling in *foreign* Member States. To this end, each provider of MTPL insurance became obliged to appoint a claims representative in every Member State to ensure that claims could be lodged in a manner (and language) that is familiar to accident victims—regardless of the Member State in which the damage occurred[72]. These representatives would bear the responsibility of gathering information relating to claims as well as taking steps to settle the claims on behalf of the relevant insurers.

NIBs—first implemented as part of the Green Card system—are now mandated in the EU Member States by the MID. These entities have three primary roles, namely (1) facilitating information exchanges between foreigners involved in accidents and their insurers, (2) facilitating payments between insurers and accident victims, and (3) administering the compensation of victims of accidents caused by unidentified- or uninsured motorists[73] (Gönülal, 2009:194). To facilitate the exchange of relevant information in the event of an accident, the MID required each NIB to set up an *information centre.* Each centre bears the responsibility of maintaining a national register containing various relevant data, including the registration numbers of vehicles in the nation's parc as well as information relating to each vehicle's insurance policy[74]. To ensure that accident victims receive compensation timeously, the MID requires that each nation designates the immediate responsibility of compensation to either their respective insurance undertakings or their NIB should a dispute relating to who is responsible for compensation arise between these entities[75]. The funds utilised to compensate victims of accidents caused by unidentified drivers or vehicles that are uninsured and/or stolen are derived from nations'

[72] Per paragraph 34 of the MID (European Parliament and the Council of the European Union, 2009).

[73] It is worth noting that Member States may place bounds on- or exclude compensation for property damages caused by an unidentified vehicle, provided that the fund did not compensate the victim(s) of the same accident for significant personal injuries.

[74] Details relating to the establishment of these information centres are provided in Article 23 of the MID (European Parliament and the Council of the European Union, 2009).

[75] Per paragraph 19 of the MID (European Parliament and the Council of the European Union, 2009).

guarantee funds[76]—dedicated funds that were established by each nation's respective NIB, as required by the MID[77]. How these guarantee funds are financed is at the discretion of their respective Member State (De Mot & Faure, 2014:571).

6.5.3.2 Insuring the Uninsurable: Provisions for High-Risk Drivers

A core challenge relating to the enactment of compulsory vehicle insurance involves balancing affordability for motorists and the potential for acceptable profitability among insurers (Regan, Tennyson & Weiss, 2008). While the MID includes provisions for the compensation of victims of accidents involving uninsured drivers, it does not provide guidance on how the Member States should manage the issue of drivers that are either deemed uninsurable or cannot afford insurance. As such, it is the responsibility of each Member State to determine its own remedy for this issue. Without effective solutions for this issue, relatively high-risk drivers may find it difficult to obtain coverage, which could result in a concerning prevalence of uninsured driving. As alluded to previously with reference to the South African context, high rates of uninsured driving can have perverse effects on the premiums of insured drivers and, in the event of an accident, complicate the compensation process.

In some European nations, such as Sweden, Germany, Denmark and Norway, insurers are obliged to contract with all motorists (De Mot & Faure, 2014:571), regardless of their level of risk. While this approach ensures the availability of coverage, it fails to address issues relating to affordability. As a result, coverage may be perceived as prohibitively expensive among high-risk motorists, potentially discouraging compliance. In other nations, such as France, Greece, Belgium and Portugal, no such obligation exists (De Mot & Faure, 2014:571). Instead, a variety of facilities have been created to operate in *residual markets* and service motorists who would otherwise be considered too risky for insurers to cover on the normal commercial market (De Mot & Faure, 2014:569). For example, Belgium's facility, known as the *Tariferingsbureau Auto* ("Car Pricing Agency"), provides an option for motorists who have had their requests for insurance rejected by at least three undertakings or have received quotations with premiums or deductibles that are deemed to be prohibitively expensive (Tariferingsbureau BA Auto, n.d.). If an applicant meets the criteria, the Tariferingsbureau assigns the individual to one of a handful of commercial insurers and determines the premium based on their risk profile (De Mot & Faure, 2014:574; Tariferingsbureau BA Auto, n.d.). Insurance undertakings that record losses as a result of covering these high-risk motorists receive compensation from a fund known as the *Belgisch Gemeenschappelijk Waarborgfonds* ("Belgian Common Guarantee Fund"), which is funded by all providers of vehicle insurance (Tariferingsbureau BA Auto, n.d.).

[76] The specific guarantee fund ultimately responsible for compensation relating to a particular accident depends on whether the driver responsible for the accident was identified.

[77] Per paragraph 14 of the MID (European Parliament and the Council of the European Union, 2009).

6.5.3.3 Scope for Variation Among Member States

Although policies like the MID and the Green Card system brought a degree of uniformity to insurance markets within the EU, opportunities for discrepancies between each nation's compulsory insurance arrangement exist. For example, while the MID specifies minimum levels of coverage that the Member States are compelled to mandate, each nation can opt to mandate higher levels of coverage than those specified in the MID (Gönülal, 2009:198). Relatedly, Member States have the freedom to set their own upper limits on coverage.

Although once regulated by governments in many states, the liberalisation of vehicle insurance markets in the EU Member States has handed the responsibility of premium-setting to the insurance undertakings themselves (Gönülal, 2009:200). Insurers hence have the freedom to employ differentiated tariffs among policyholders and, as a result, these private entities are granted an incentive-based mechanism with which to combat moral hazard. This contrasts with the compulsory arrangements of South Africa, New Zealand and China, which maintain state control over pricing and, by consequence, deterrence.

While insurers have been given a large degree of freedom relating to rate-making, a ruling made in 2011 by the EU Court of Justice does prohibit insurers from using gender as a rating factor (European Commission, 2012). Given the competitive nature of motor insurance markets within the EU (Gönülal, 2009:200) and the need to rethink the rate-making process, variation between the value propositions of advantage-seeking MTPL providers is not uncommon. It has been suggested that, by forcing insurers to adopt alternative, "non-discriminatory" methods of assessing risk, the ruling has inadvertently encouraged the EU's insurers to launch- and prioritise UBI policies that base their premiums on objective driving data (Ayuso *et al.*, 2017:3; Friedman & Canaan, 2014:24; Paefgen, Staake & Thiesse, 2012:3; Sierra Wireless, 2015:5). In addition, because this ruling would result in raised premiums for some motorists, it may have stoked the uptake of UBI policies among affected policyholders.

As discussed in Section 6.5.3.2, the MID does not provide guidance for Member States relating to the compulsory coverage of motorists that are deemed to be prohibitively risky by insurers. As such, Member States have adopted an array of methods for dealing with this challenge.

Beyond MTPL and the Green Card system, Member States of the EU have employed a suite of pricing interventions aimed at internalising the external costs associated with road transport. While these interventions and their associated charges are not uniform across all 27 Member States, they can be categorised broadly into five groups, namely taxes on insurance premiums, infrastructure charges, taxes on vehicle ownership, registration taxes and fuel taxes (van Essen *et al.*, 2012:16). Because the revenue streams associated with these instruments are not all ring-fenced, they do not necessarily aim to offset accident costs exclusively. All but seven EU members do, however, impose taxes—often earmarked in

part for activities relating to road accident risk[78]—on insurance premiums (Schroten, Scholten, van Wijngaarden, van Essen, Brambilla, Gatto, Maffii, Trosky, Kramer, Monden, Bertschmann, Killer, Greinus, Lambla, El Beyrouty, Amaral, Nokes & Coulon, 2019). While these taxes are popular among European nations, they do vary significantly in both magnitude[79] and their specific earmarked purposes.

6.5.3.4 The Italian Job: Leading the Charge for Telematics Proliferation

Catalysed by favourable state regulation aimed at stomping out vehicle theft and insurance fraud as well as encouraging transparency and competitive behaviour, the Italian UBI segment is among the most mature in global markets. With more than 6.3 million vehicles covered by "black box[80]" policies in 2017—equivalent to approximately 20 percent of the nation's entire fleet of insured vehicles (Insurance Europe, 2019:23)—the Italian state's efforts to disseminate telematics-based policies have been remarkably successful.

An array of new regulations with direct bearings on the country's vehicle insurance industry were enacted by the Italian state in 2012[81] and 2017[82]. Improved affordability for vehicle owners was at the core of the state's attempts to induce UBI proliferation voluntarily. For example, these new regulations made it mandatory for UBI providers to bear the full financial brunt associated with the telematics devices required by their policies (IHS Markit, 2016). Furthermore, policyholders would be entitled to compulsory discounts of "significant" value if (1) they agreed to undergo a physical vehicle inspection by the insurer, or (2) they agreed to have their driving behaviour monitored using an appropriate telematics device, or (3) they had their vehicle fitted with a breath-alcohol immobiliser (Carretta, 2017). By fostering a greater degree of competition within the vehicle insurance market, consumers would, in time, have a broader assortment of insurance policies from which to choose. By the end of 2018, 25 of the country's 40 insurers—controlling 80 percent of the total market share—offered telematics-based policies (IVASS, 2019:100).

The new array of regulations placed responsibility on the Institute for the Supervision of Insurance (commonly referred to as IVASS) and the nation's Ministry of Economic Development for implementing rules relating to the collection-, management- and use of telematics data. These institutions were also tasked with developing standards for both hardware and software to ensure

[78] In contrast, premiums from short-term insurance products form part of the VAT net in South Africa (SARS, 2016:1), meaning that the associated revenues are not ring-fenced and accrue to the nation's general fiscus.

[79] From a mere two percent in Bulgaria to 43 percent in Denmark (Schroten *et al.*, 2019:65).

[80] The term *black box* is commonly used in the Italian vehicle insurance industry to refer generally to telematics devices that allow various aspects of driving behaviour and vehicle conditions to be monitored remotely, as well as allow certain dynamics of road accidents to be reconstructed (IVASS, 2019:260).

[81] Decree Law 1/2012, also known as *Cresci Italia* ("Grow Italy").

[82] Legislative Decree 4 August 2017 n.124, also known as *Competition Law 2017*.

interoperability of the telematics systems between different insurers (Porrini, 2014:563; Porrini, Fusco & Magazzino, 2020:462). This interoperability would, for example, allow policyholders to change from one insurer to another without having to replace an already-fitted telematics device. It is also envisaged that UBI policyholders could have their driving data transferred from one insurer to another, thereby allowing insurers to harness existing driving records and circumvent additional "profiling" periods. In practice, this would also allow existing UBI policyholders to obtain quotations from other insurers- and switch between insurers with minimal inconvenience. Despite standardisation limiting the friction endured by switching policyholders, clients with telematics-based policies in Italy have displayed a lower propensity to change insurers than those with traditional policies (IVASS, 2019:100)—perhaps a reflection of the ability of UBI policies to deliver benefits to consumers based on their revealed driving behaviour and, by doing so, cultivate improved customer satisfaction.

Italian UBI policies have also had noteworthy benefits for both insurers and policyholders relating to compensation. By collecting- and analysing objective data relating to vehicle dynamics in the build-up to accidents, Italian UBI providers have sped up average claim settlement times by five percent while curtailing the expenses associated with these settlements by approximately six percent (Dang, 2017:20).

Although the national penetration rate of black box policies is considerably higher than anywhere else in the world, the share of these policies varies significantly across the country's provinces (Dang, 2017:9). Driven by relatively high average premiums, the country's southern provinces have been quickest to adopt these policies. In Caserta and Naples, approximately 63- and 55.5 percent respectively of all vehicle insurance policies incorporated telematics devices by the end of 2018. This is in stark contrast to the 4.1- and 6.1 percent penetration rates of Bolzano and Belluno respectively (IVASS, 2019:99). This disparity highlights the importance of affordability within the Italian market as well as the associated appeal of discounts offered in exchange for driver monitoring (Dang, 2017:9). The rate of adoption has also been disproportionately high among younger drivers (Insurance Europe, 2019), supporting the proposition that UBI policies appeal most strongly to those who would otherwise be viewed as relatively risky policyholders based on traditional rate factors.

In addition to Italy's own regulations, efforts made at a continental level—such as the obligatory nature of MTPL coverage—have played a role in curtailing the proportion of uninsured vehicles on the nation's roads. As of 2017, a modest 6.3 percent of vehicles in Italy were uninsured (Insurance Europe, 2019:21). While the share of uninsured vehicles on Italian roads remains low as a result of mandatory MTPL coverage, the presence of these uninsured vehicles remains a risk. As such, a fund—financed by a 2.5 percent ring-fenced tax levied on vehicle insurance premiums—exists to provide compensation to victims of road accidents caused by uninsured vehicles, (van Essen *et al.*, 2012:33).

6.6 Summary and Discussion

This chapter set out to explore the potential merits and challenges associated with a potential alteration of South Africa's existing road accident compensation arrangement, as well as the potential scope for adopting UBI principles as part of the nation's future arrangements. To this end, the chapter elucidated the core operational challenges faced by the RAF (see Figure 6.8) before exploring the insurance arrangements of some of South Africa's international counterparts. The case study showcased the varied nature of nations' insurance-based approaches for mitigating the external costs associated with road traffic accidents and, in doing so, highlighted that no nation's approach should necessarily be viewed as a panacea. By intentionally spurring the uptake of UBI as part of its MTPL arrangement, the Italian state has, however, improved affordability, reduced the prevalence uninsured driving, curtailed insurance fraud and combatted vehicle theft while providing an ongoing incentive for improved driving behaviour. Some of the core differences between the nations' compulsory insurance arrangements are outlined in Tables 6.4 through 6.7 at the end of this section.

Inherent flaws in the RAF's PATP funding model have made the state insurer's responsibilities increasingly difficult to fulfil. A core funding flaw relates to the use of fuel consumption as a proxy for risk exposure, meaning that the relationship between the organisation's income and expected expenditures is largely arbitrary. In addition, continuous improvements in the fuel efficiency of ICE vehicles combine with the disruptive potential of electrified vehicles to pose a mounting threat to the organisation's primary revenue stream without a corresponding reduction in its expected expenditures. The outcome of these factors is a funding model with widening unsustainability and an inherent failure to reflect the user-pays principle. As such, motorists are presented with a perverse link between their driving behaviour and coverage costs, creating an unclear economic incentive for improved driving behaviour. In addition, because motorists cannot opt to contribute to an alternative insurer that they deem to be superior, the potential for public scrutiny towards the RAF may be noteworthy. While weakening the strength of hypothecation (i.e., allowing the state to supplement the RAF's existing funding sources) could assist the organisation to overcome its immediate financial woes, the success of an approach of this nature would be inextricably dependant on the sources used to supplement the fund's existing revenue sources. Moreover, the merit of this approach would be significantly eroded by its failure to address the core challenges of the RAF's existing funding model.

In addition to the issues that relate to funding, the RAF's claims environment has presented challenges to both the entity itself and the accident victims that it exists to serve. The litigious environment in which the fault-based scheme operates has made compensation inaccessible and unpredictable for accident victims as well as inflated the entity's delivery costs. Furthermore, it has been suggested that the fault-based nature of the scheme has been taken advantage of by the RAF itself as a means to stall payments and, in doing so, alleviate the entity's cashflow challenges. Moreover, the once-off nature of compensation prevents claims from being re-evaluated to reflect potential changes in the needs of

accident victims and places undue pressure on the organisation's cashflows. In addition, the majority of vehicles on South Africa's roads are not covered by any form of property insurance, as coverage beyond that offered by the RAF is not mandated. Because of this, a noteworthy share of the costs associated with accidents remains external.

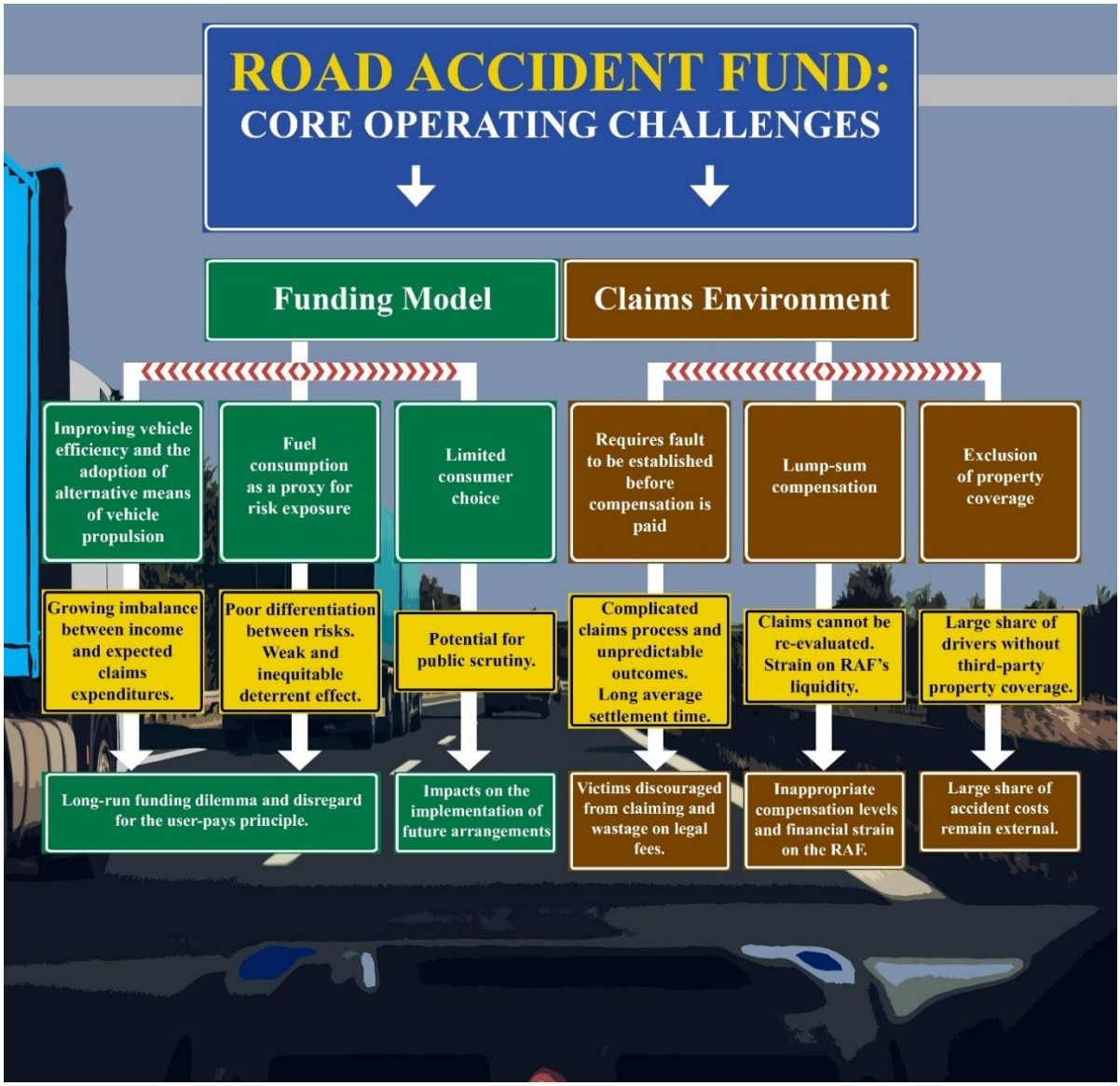

Figure 6.8: Core challenges relating to the Road Accident Fund's funding model and claims environment.

Source: Own

New Zealand is one of only a handful of nations other than South Africa to rely largely on PATP funding to support its road accident compensation arrangement. Like in the case of South Africa, this ring-fenced funding accrues to a single state-run entity with the responsibility of compensating accident victims. While the similarities between the nations' schemes are notable, several key disparities exist between both the schemes themselves and the environments in which they operate. Although, like in South Africa, no form of property insurance is mandated in New Zealand, less than eight percent of vehicles

are not covered against third-party property damages. This near-universal rate of voluntary subscription is far removed from the South African context, in which up to 70 percent of vehicles remain uninsured. As a result, in the event of an accident, the likelihood of receiving some form of compensation for property damages from either a wrongdoer (or their insurer) is arguably significantly higher in New Zealand than in South Africa. Because of the widespread voluntary adoption of property insurance in the Pacific nation, the marginal benefits of enacting- and enforcing compulsory third-party property insurance may be outweighed by the costs thereof.

Underpinned by comparatively admirable road safety outcomes, New Zealand's no-fault road accident compensation scheme faces considerably fewer claims each year than the RAF—even with consideration for the disparity in the nations' vehicle fleets. On average, New Zealand's road accident compensation scheme is also less financially burdensome on motorists than that of South Africa—as reflected in the average annual revenue obtained per vehicle. New Zealand's government has openly acknowledged the need to reconsider its existing charging mechanism—citing the growing popularity of fuel levy-exempt diesel vehicles and the disruptive potential of electric vehicles as key causes for concern. To this end, the state has taken early steps to explore the potential adoption of distance-based insurance charges. As such, with its closest counterpart from the developed world set to follow a new course, the RAF may find itself increasingly isolated on the global stage.

In much of the rest of the world, third-party coverage against either bodily harm alone or both property damage and bodily harm is mandatory and provisioned by insurers from the private sector. One such developing nation to adopt this approach is China. Since the 1980s, when market-oriented reforms in the nation were promoting unprecedented private participation and foreign investment, the Chinese market for vehicle insurance has grown from non-existence into a global leader. While some aspects of the vehicle insurance market are still strictly controlled, the government has progressively eased regulations on foreign participation and tariff-setting while broadening coverage. Relatively low levels of mandated MTPL coverage in China have, however, encouraged the vast majority of motorists to take out commercial policies with extended third-party protection. Although the uptake of commercial UBI in China has been somewhat underwhelming to date, a progressively liberalised regulatory environment may pave the way for future expansion. Consequently, UBI remains an area of considerable interest among industry insiders (Jiang *et al.*, 2020; Zhanhang, 2021). Whether the freedom to employ differentiated pricing will be afforded to providers of compulsory MTPL remains to be seen. Without this liberalisation, compulsory MTPL products may simply remain an entry point to the market through which commercial products can be sold.

In the EU, where motor insurance regulation is largely harmonised, MTPL insurance has been compulsory since the early 1970s. Various EU directives and multilateral agreements have been put in place to ensure that accident victims receive comparable treatment regardless of their locale. In addition,

these policies have ensured that motorists can travel freely to most locations within the continent without the hindrance of border checks on insurance. Under South Africa's existing RAF arrangement, visitors to the country receive the same automatic coverage as locals. Accordingly, the adoption of an alternative compulsory MTPL insurance arrangement may necessitate the formulation of new regulations for visiting motorists. In addition to ensuring coverage across the EU, the MID includes provisions aimed at expediting the payment of compensation and ensuring that victims of accidents involving unidentified-, uninsured- and/or stolen vehicles receive timeous compensation. Although the RAF does, under certain circumstances, compensate victims of accidents involving unidentified wrongdoers, the existing claims environment rarely yields expeditious results.

While EU-wide regulations provide a broad operating framework in which insurance undertakings must operate, a degree of heterogeneity can- and does exist between Member States' insurance arrangements. For example, each nation can establish its own minimum coverage requirements, provided that they match- or exceed the minimum requirements specified by the MID. In addition, premiums are set at the discretion of insurance undertakings and are influenced by competitive forces. If South Africa were to adopt a form of compulsory MTPL insurance, the state would have to establish its own regulations relating to coverage. These would need to include requirements concerning the type of mandated coverage (i.e., personal injury coverage, property coverage or both) as well as the mandated lower- and upper bounds on coverage. The gravity of decisions relating to the types of- and bounds on coverage should not be downplayed. For example, while high levels of mandated coverage may ensure that policyholders are largely protected against losses and that accident victims are likely to achieve adequate compensation, the associated costs may be prohibitively expensive for motorists—potentially impacting compliance rates. Similarly, coverage that raises the costs of road-based transport may have a stifling effect on mobility and economic activity. Conversely, low levels of coverage may not sufficiently protect motorists against losses and could leave a larger share of accident costs external if injurers are insolvent and unable to settle liability judgements as a result.

In the context of mandatory MTPL insurance, ensuring that coverage is both available and affordable to all motorists, irrespective of insurers' perceptions of their risk, is inherently important for discouraging uninsured driving. In the context of South Africa's existing RAF arrangement, the availability is coverage is guaranteed—even for drivers who would typically be considered uninsurable by conventional insurers. If the country were to adopt mandatory vehicle insurance in a similar arrangement to the EU or China, the question of how the state intends to ensure affordability and availability would need to be addressed, as a failure to do so could result in poor rates of compliance. From an availability perspective, the state would have to decide whether it would compel insurers to accept all motorists—regardless of their risk—or facilitate the establishment of a residual market that serves particularly high-risk motorists. Either of these options would require the state to establish the degree of freedom that insurers would have when determining motorists' premiums (including the bonus-malus systems used

to determine potential discounts based on claims histories). If the state were to give insurers the freedom to set premiums purely on the basis of risk—as in Sweden, Germany, Denmark and Norway—particularly high-risk motorists may face premiums that they perceive to be unaffordable, which could, in turn, discourage compliance if enforcement is ineffective. While this approach might necessitate stronger enforcement, it does arguably grant insurers greater influence over road safety by allowing them to employ tariffs that theoretically incentivise desirable driving behaviour. In other words, this approach hands the responsibility of controlling moral hazard to insurers.

Conversely, placing firm upper bounds on high-risk policyholders' premiums may, without intervention, strain insurers' financial sustainability. As such, when met with an obligation to contract and limited control over pricing, insurers might simply opt not to participate in the market. As a result, Faure (2006) argued that this approach might be overly reliant on insurers that ultimately have no obligation to participate in a given market. Among those that do opt to participate, limited control over pricing could prompt insurers to charge their lower-risk clients more than what their risk level would otherwise dictate in an effort to offset the expected losses stemming from particularly high-risk clients. This cross-subsidisation is incongruous with the user-pays principle and would, in theory, weaken the deterrent effect of higher premiums. As such, insurers' mechanism for controlling moral hazard would be impaired. Alternatively, the state might opt to offset the losses incurred by insurers as a direct result of furnishing high-risk drivers' mandatory coverage requirements. While this approach—as used in Belgium—would allow upper bounds to be placed on premiums without the need for cross-subsidisation between clients, the weakened deterrent effect among higher-risk motorists would not be addressed. Moreover, the state would need to establish how this approach would be funded. In an environment that does not allow risk-based MTPL pricing, the scope for- and benefits of UBI would be constrained, as insurers would not necessarily have the freedom to reflect granular driving data in policyholders' premiums. Naturally, environments that do not allow risk-based pricing also prevent flat-rate taxes levied on insurance premiums from reflecting risk.

In China, the separation between mandatory MTPL insurance and commercial insurance represents a unique approach for encouraging participation from insurers despite the overarching "no profit, no loss" principle. Although insurers are obliged to accept high-risk drivers and have limited scope for reflecting this risk in their premiums, opting to furnish MTPL coverage provides insurers with an entry point to the market through which potentially profit-bearing voluntary insurance products can be sold. Although this approach does ensure availability while allowing the state to control affordability, it does not negate challenges relating to cross-subsidisation between risks and the resultant theoretical impact on deterrence. Considerations relating to the management of high-risk motorists in the context of MTPL insurance are summarised in Figure 6.9.

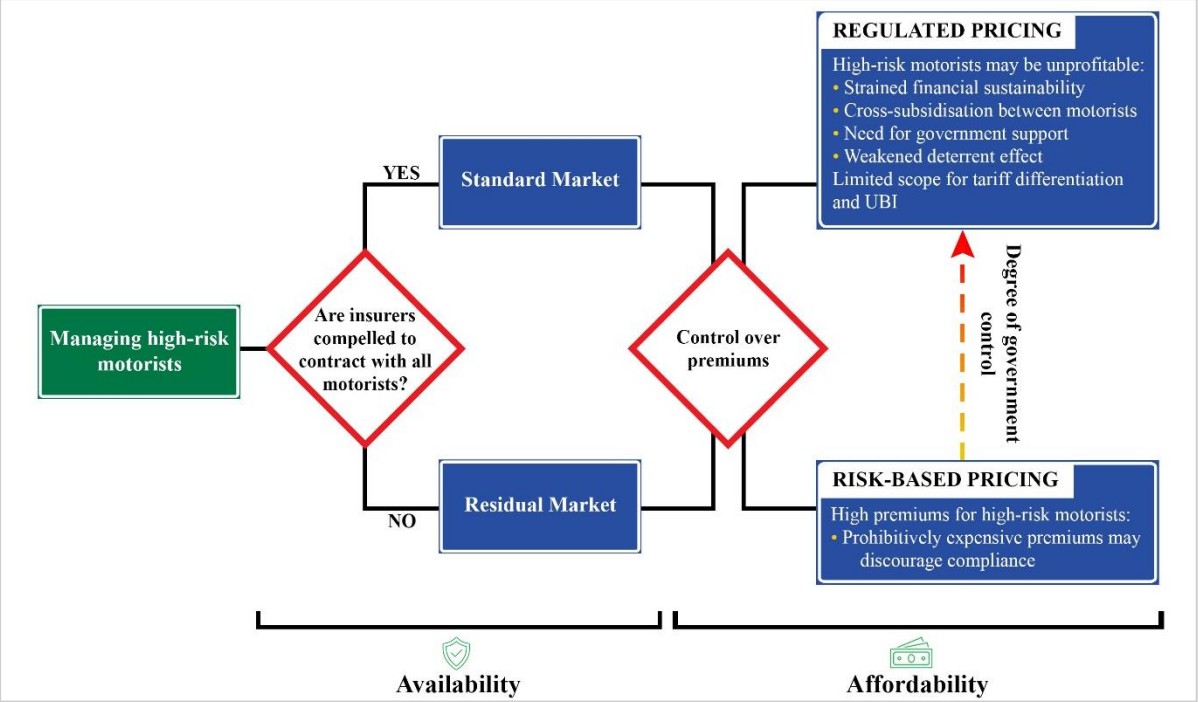

Figure 6.9: Managing insurance availability and affordability for high-risk motorists.

Source: Own

Even if efforts are made to ensure both the availability- and affordability of mandated MTPL insurance, universal compliance is not assured. As such, the adoption of compulsory MTPL insurance in South Africa may necessitate the establishment of a guarantee fund with the purpose of protecting accident victims against unidentified- or uninsured drivers. Without a fund of this nature, a portion of the accident costs imposed by uninsured drivers may remain external. The magnitude of funding required to sustain this facility would be inextricably linked to the proportion of uninsured motorists, as well as their associated accident rates. Hypothecated taxes on insurance premiums might be employed by the state to meet the funding requirements of this facility, however, decisions relating to funding would ultimately be at the discretion of the state.

In compulsory insurance arrangements that grant insurers the freedom to differentiate premiums, UBI policies could be particularly effective as a remedy for moral hazard. By reflecting granular driving data in premiums, modern UBI policies offer policyholders ongoing incentives for risk mitigation. As a result, UBI is often prescribed by economic researchers as an effective internalisation measure for accident costs (van Essen *et al.*, 2012; Santos *et al.*, 2010). Through the enactment of relatively new insurance decrees, the Italian state has signalled its belief in this proposition. The EU's regulations on MTPL insurance have combined with Italy's own domestic decrees to create an enabling environment for the dissemination of telematics-based policies. From the perspective of consumers—particularly those typically considered risky by insurers—the opportunity to receive significant savings in exchange for behaviour monitoring has intuitive appeal. Between the enactment of Decree Law 1/2012 and the year 2016, telematics-based policies have contributed towards reducing average MTPL premiums by

more than 20 percent (Insurance Europe, 2019:17). By offering discounts and behaviour-based pricing, first-movers that offer black box policies have given themselves a competitive edge and afforded themselves a head start in collecting the data required to underpin reliable predictive models. Owing to the objective nature of this driving data, insurers and policyholders alike have benefitted from shortened average claim settlement times. Relatedly, black box policies have played a role in combating insurance fraud and vehicle theft—two of the nation's leading contributors to claims (Porrini *et al.*, 2020:458). Moreover, consumer concerns relating to privacy and security may be doused by the existence- and monitoring of the rules set out by the country's independent regulatory authority—IVASS. In addition, by allowing UBI policyholders' compulsory premiums to reflect their observed driving behaviour, the Italian state has created a base on which to levy taxes that automatically align with the user-pays principle.

As a result of Italy's success in fostering the proliferation of UBI, it might be that the nation's efforts represent a possible roadmap for South Africa to follow towards a destination with low rates of uninsured vehicles, fair- and affordable premiums, abundant consumer choices, few fraudulent claims, reduced incidences of vehicle theft and a fairer reflection of the user-pays principle.

Table 6.4: Features of national compulsory insurance arrangements.

Features of the Compulsory Insurance Arrangement				
	South Africa	**New Zealand**	**China**	**Italy**
Is some form of compulsory insurance mandated?	Yes.	Yes.	Yes.	Yes.
Is third-party personal injury coverage included under the compulsory arrangement?	Yes.	Yes.	Yes.	Yes.
Is third-party property coverage included under the compulsory arrangement?	No.	No.	Yes.	Yes.
Is compulsory insurance provisioned by the public- or private sector?	Public.	Public.	Private.	Private.
Do motorists need separate policies for voluntary- and optional insurance?	Yes.	Yes.	Yes.	No.
Do motorists have a choice between different compulsory insurers?	No.	No.	Yes.	Yes.
Name of the insurer (if public).	Road Accident Fund.	Accident Compensation Corporation.	N/A.	N/A.
Are providers of compulsory insurance obliged to contract (i.e., do insurers have to accept all potential clients, regardless of their risk)?	Not applicable in the context of a universal PATP scheme (as no contractual agreements are made).	Not applicable in the context of a universal PATP scheme (as no contractual agreements are made).	Yes.	Yes.

Source: Own

Table 6.5: Features of national compulsory insurance arrangements relating to funding and tariffs.

Features Relating to Funding/Tariffs				
	South Africa	**New Zealand**	**China**	**Italy**
How do motorists pay for coverage?	PATP levy.	PATP levy and annual vehicle licencing fees.	Periodic premiums.	Periodic premiums.
Are compulsory premiums controlled by the state or determined on the basis of risk?	Per-litre charges are fixed by the state.	Per-litre charges and annual licencing fees are fixed by the state.	A base rate is determined by the state. Insurers may adjust this standardised premium within a fixed range based on motorists' claims histories and region of residence.	Private insurers determine premiums on the basis of risk.
What factors influence the magnitude of compulsory premiums?	The volume of fuel utilised.	The volume of fuel utilised.	Policyholders' claims histories and region of residence.	Risk-based pricing. Insurers must use "non-discriminatory" rate factors.
Are insurance premiums taxed?	N/A in the case of the RAF. 15% VAT is charged on optional insurance premiums.	15% GST is charged on annual vehicle registration fees. The ACC component of this annual levy is included in the calculation of GST. Optional vehicle insurance policies are subject to GST, a Fire Service Levy and an Earthquake Levy.	6% VAT is levied on all insurance premiums. This is double the standard VAT rate.	2.5% ring-fenced tax on vehicle insurance premiums for the Road Victim Warranty Fund.

Source: Own

Table 6.6: Features of national compulsory insurance arrangements relating to compensation.

Features Relating to Compensation				
	South Africa	**New Zealand**	**China**	**Italy**
Format of compensation (relating to compulsory vehicle insurance only)	Lump-sum.	Temporary periodic payments for income losses during rehabilitation. Certain medical bills and other rehabilitation costs are covered and reviewed periodically. Lump-sum compensation for certain permanent impairments.	Unless otherwise agreed, compensation is paid as a lump-sum by default.	Compensation is typically paid as a lump-sum.
Which entity is responsible for compensating victims of hit-and-run accidents?	RAF for injuries.	ACC for injuries.	Road Accident Social Relief Fund.	Road Victim Warranty Fund.
Does fault have to be established before accident victims can receive compensation from the insurer?	Yes.	No.	Accident victims can receive compensation from insurers irrespective of fault, however, the limits on liability are significantly larger if a driver is at-fault.	Usually. Italy does, however, make use of a strict liability regime to protect vulnerable road users (such as pedestrians and cyclists) and passengers. As such, drivers are typically assumed to be negligent in accidents involving these groups. If accidents involve more than two vehicles, it is typically assumed that all of the drivers involved shared equal fault.

Source: Own

Table 6.7: Miscellaneous contextual information relating to national compulsory insurance arrangements.

Miscellaneous Information				
	South Africa	**New Zealand**	**China**	**Italy**
Proportion of uninsured vehicles.	All motorists are automatically covered by the RAF. Up to 70% of vehicles were not covered beyond the scope of the RAF (i.e., for any form of property damage) in 2018.	All motorists are automatically covered by the ACC. Fewer than 8% of vehicles were not covered by some form of property coverage (i.e., third-party or comprehensive) in 2008. Similar results were observed in 2020.	Approximately 5% of cars are without compulsory coverage. Less than 18% of the vehicle parc was not covered by some form of optional MTPL coverage or comprehensive coverage in 2018.	6.3% of vehicles were without compulsory coverage in 2017.
What recent efforts have been made to better reflect the user-pays principle in the setting of compulsory insurance tariffs?	None.	The state has signalled its intention to employ distance-based ACC charges as a replacement for its levy on annual registration fees. It is worth noting that distance-based road user charges have been employed for diesel vehicles as an alternative to the National Land Transport Fund fuel tax.	The mandated bonus-malus system was adjusted to allow a greater degree of variation in compulsory tariffs based on policyholders' driving records and region of residence.	All motorists have been offered an incentive (in the form of guaranteed premium discounts) to adopt telematics-based UBI.
Estimated number of road deaths (2016)	14,507	364	256,180	3,428
Estimated road deaths per 100,000 population (2016)	25.9	7.8	18.2	5.6

Source: Own

7 RECOMMENDATIONS FOR FUTURE RESEARCH

Because South Africa's UBI market is in its infancy, related research is notably scant in the local context. Owing to the high-level, exploratory nature of this study, several opportunities for future research were, however, identified. In this brief chapter, five broad avenues for future research are proposed and concisely discussed. These research avenues include (1) complementary market segment assessments, (2) an exploration of the local insurance industry's perceptions of UBI, (3) studies that probe the public's perceptions of the RAF and alternative insurance arrangements, (4) investigations into the potential impacts of feedback and/or incentives on driving behaviour and (5) attempts to quantify the economic benefits and costs of UBI.

7.1 Complementary Market Segment Assessments

Owing to the exploratory nature of the market segment assessment survey, this exercise did not necessarily intend to provide results that were either wholly conclusive or exhaustive. Instead, the assessment explored a wide assortment of themes that were deemed to be of relevance in the context of UBI to produce foundational insights relating to the youthful segment. Accordingly, it is recommended that further efforts are made to advance knowledge concerning demand-side perceptions of UBI.

While the survey prioritised the exploration of a variety of themes, care had to be taken to ensure that its completion time would not be overly burdensome on participants. This meant that only a handful of questions relating to each theme could be asked. As such, it is recommended that future researchers use the survey results as a guide for directing the selection of avenues for subsequent in-depth explorations. For example, while the survey gathered a variety of perceptions, it did not necessarily explore the underpinnings- or consequences thereof.

Relatedly, the study prioritised the exploration of public transport as an alternative to private vehicle use while placing limited emphasis on other travel options. Based on the results of the market segment assessment survey, it would appear that active transport, lift sharing and e-hailing were generally viewed as more viable alternatives to private vehicle use than public transport and, as a result, should arguably have received more attention in the survey itself. As such, it is suggested that further effort is made to understand the underpinnings of modal choices among the youthful segment.

Although the survey conducted as part of this study deliberately prioritised the youthful segment of the market, it is strongly recommended that further research relating to more-mature segments is undertaken. While the youthful segment has been the driving force behind the proliferation of UBI policies in some nations with more-mature UBI markets, such as Italy, disparities between the South African vehicle insurance environment and that of other nations could potentially lead to divergent uptake trajectories. One such disparity is the voluntary nature of vehicle property insurance in the South African context. In the local context, when met with unaffordable premiums, motorists might simply

forfeit property coverage and still remain within the law. In Italy, where property coverage is mandated, motorists do not have the freedom to forfeit their coverage while remaining compliant with regulations. As such, when met with unaffordable premiums, law-abiding Italian motorists *may* feel more pressed to consider alternative insurance schemes than cancelling their coverage altogether.

Relatedly, the placement of a chronological boundary (i.e., a firm upper age limit) on the segment prioritised in the survey was somewhat subjective and based loosely on the premise that the broader population could be divided into non-overlapping cohorts with distinctive traits based on age alone. As such, further research involving a wider target population is recommended.

There is also little doubt that the market segment assessment survey gathered responses from many drivers who would only become insurance clients in the coming years. As such, for a comprehensive understanding of the *current* market for UBI to be established, the perceptions of more-mature segments should not be neglected. Similarly, as alluded to in Section 4.1.9, the sample employed was not necessarily perfectly representative of all young drivers in South Africa. As such, it is suggested that further analysis is undertaken to explore the generalisability of the results at a national level.

Perhaps most importantly, even though the experiences of some nations suggest that the youthful segment will contribute disproportionately to UBI demand, more-mature segments may yet contribute meaningfully. While one might predict that the youthful segment may have a disproportionately large share of Forerunners, this conjecture does not rule out the existence of Forerunners among older groups. As such, estimating the size of the market for UBI is not advised without consideration for the perceptions of UBI held by more-mature segments.

As mentioned in Section 5.12, different permutations of UBI may vary in their commercial viability and likelihood of consumer adoption, as well as their ability to create shared value. While the study gauged relatively high-level opinions relating to UBI as a concept, future studies might explore perceptions of an array of specific attributes of potential UBI marketing mixes, including premium structures, possible value-added services and distribution channels. Although not exhaustive, Chapter 5 presented a host of attributes that could be investigated from the perspective of the market. In doing so, future researchers might attempt to elucidate the appetite for certain UBI attributes among the market (or segments thereof).

As highlighted in Chapter 6, motorists in neither South Africa nor New Zealand are required to purchase any form of vehicle property insurance. Despite this similarity, the proportion of insured vehicles on New Zealand's roads is considerably higher than in South Africa. A comparative study of the attitudes towards vehicle property insurance—whether usage-based or not—among motorists in both nations is hence recommended. A study of this nature may hold value in the development of strategies aimed at encouraging the voluntary uptake of property insurance among motorists in South Africa.

Lastly, the market segment assessment survey related primarily to personal lines insurance (as opposed to commercial lines). As such, it is recommended that future studies are undertaken to explore the sentiment towards commercial UBI among employers with workforces that require regular road-based travel. While the duties of these employees may limit the extent to which UBI can encourage VKT curtailment, these policies may appeal to the likes of business owners and fleet managers as a means to monitor- and potentially improve the manner of vehicle use among drivers.

7.2 Local Industry Perceptions of Usage-Based Insurance and Potential Compulsory Insurance Arrangements

The survey conducted, as well as those proposed in Section 7.1, focussed chiefly on consumer perspectives while leaving supply-side perspectives unexplored. It would appear that publicly available opinions that relate to the future of local UBI offerings from the insurance industry itself are somewhat limited. This is particularly true of insurers that are yet to launch UBI offerings of their own. Accordingly, it is recommended that efforts are made to gauge the local industry's standing on UBI, which might involve interviews with high-ranking decision-makers employed by insurers (such as C-level- and senior executives). Themes that could be explored in a study of this nature might, for example, include:

- Estimates of the benefits- and costs of UBI;
- Potential plans for the introduction-, alteration- or withdrawal of UBI products;
- Current- and planned capacity for integrating driving data into rate-making processes;
- Entry barriers that have hindered the introduction of UBI products;
- The current- and potential competitive landscape;
- The impacts of UBI on traditional policyholders' premiums.

In addition to gauging the industry's perceptions of UBI, future studies might attempt to unpack the industry's stance on the potential introduction of new mandatory vehicle insurance regulations. Although the short-term insurance industry's representative body has called for the introduction of mandatory third-party property insurance (SAIA, 2019:27), individual insurers' stances on the proposed scheme have not been explored in depth. Themes worth probing might include:

- The industry's suggestions relating to the types of- and limits on mandatory coverage;
- The industry's preferred means of managing particularly high-risk drivers;
- The predicted implications of mandatory insurance on average premiums;
- The industry's ideal timeline for the introduction of mandatory insurance;
- The industry's capacity to handle significant increases in its client base;
- The potential role of the RAF in future arrangements.

7.3 Public Perceptions of the Road Accident Fund and Alternative Arrangements

As discussed in Chapter 6, the RAF's PATP funding model is administratively convenient and ensures that motorists cannot evade their responsibility of contributing financially to the organisation. Because contributions to the fund are bundled into the retail price of fuel, the perceived vividness of these contributions may be somewhat obscured when compared to a setting in which fuel and mandatory insurance are purchased independently. It might even be that some motorists are unaware of the existence- or magnitude of the RAF levy. Relatedly, unless motorists remain actively aware of the composition of the retail price of fuel, annual increases in the RAF levy may be obscured by changes in any of the other components of the retail price. This is particularly relevant, given that certain components of the retail price are altered by a larger extent- and at more regular intervals than the RAF levy. As such, altering the mandatory insurance arrangement of South Africa to one which includes some form of non-PATP-funded coverage may be viewed as an additional charge rather than as a replacement for the RAF levy. Similarly, the introduction of a mandatory insurance scheme that does not consider vehicle usage when determining premiums could raise the costs of vehicle ownership among some motorists noteworthily—particularly among low-VKT drivers who are not currently covered beyond the scope of the RAF. While it might be argued that an alteration of the existing insurance arrangement would simply be an attempt to correct a market failure, a lack of viable alternatives to private vehicle usage may raise concerns relating to equity. Given the combination of the poor historical performance of the RAF, concerns over the alternatives to private vehicle usage and widespread mistrust in the state, the state may face a degree of public resistance if it were to implement a charge that is larger than before. As such, it is recommended that efforts are made to gauge the public's perceptions of the current insurance arrangement, as well as of potential future arrangements. Themes that might be explored include:

- Awareness- and perceptions of the RAF, its purpose, its funding method and claims process;
- Sentiment towards privately-provisioned mandatory coverage (as required in the EU and China) as opposed to state-provisioned coverage;
- Willingness to comply with hypothetical mandatory insurance regulations;
- Willingness to adopt some form of UBI if vehicle insurance were to become mandatory.

7.4 The Impacts of Feedback and/or Incentives on Driving Behaviour

While the tariff structures of modern UBI policies typically have intuitive theoretical impacts on policyholders' incentives to curb vehicle use and adopt responsible driving habits, little research has explored the extent to which these theoretical impacts translate into practical road safety outcomes. A

handful of studies undertaken in developed countries on this topic have yielded mixed results[83], however, publicly available efforts made in the South African context are negligible. As such, three broad methodological approaches are proposed for future studies relating to the potential impacts of feedback and/or incentives on driving behaviour, namely (1) a driving simulator-based experiment, (2) a long-term telematics-based field experiment and (3) an exploration of existing claims data and/or driving data.

In the proposed simulator-based experiment, groups of participants would be required to drive for fixed timeframes or distances in a driving simulator while being exposed to feedback and/or incentives of varying natures. If only completing a single simulator run for each participant is practicable, between-group comparisons of aspects of participants' driving behaviour could be conducted. If multiple simulator runs can be conducted for each participant, before-versus-after comparisons could be made between each drivers' before-intervention run(s) and subsequent run(s) in which the designed intervention is employed.

While simulator-based studies represent useful attempts to isolate the effects of immediate feedback and incentives on driving behaviour over the short-term without the impact of external influences, it is of the opinion of the researcher that a GPS-based field experiment conducted over a longer timeframe would be a more useful approach for assessing the effects of feedback and incentives on driving behaviour. Because participants would be required to drive for a fixed timeframe or distance in a simulator study, the impact of feedback and incentives on VKT curtailment would not be explored. Similarly, because participants' driving behaviour would only be monitored over a limited timeframe, designing an incentive structure that is both impactful and realistically simulates the incentive structure of an actual UBI offering may prove challenging. While simulator studies explore how drivers respond to certain stimuli given that trips are already taking place, a field study conducted over a longer period would arguably allow for a more naturalistic experiment in which participants can take trip decisions into their own hands.

The proposed field experiment would involve monitoring a sample of motorists using GPS tracking devices over a specified period. During the initial phase of tracking, participants' usual driving behaviour would be monitored and an individual driver profile would be established for each participant against which their subsequent driving behaviour would be compared. Each participant would be randomly assigned to either a control group or an intervention group. While the specifics of the designed intervention(s) would be defined at the hypothetical researcher's discretion, it is recommended that feedback is provided to participants fairly frequently using a convenient platform (e.g., daily text

[83] See Bolderdijk, Knockaert, Steg & Verhoef (2011); Cohen & Shmueli (2018); Dijksterhuis, Lewis-Evans, Jelijs, De Waard, Brookhuis & Tucha (2015); Greaves, Fifer & Ellison (2013); Hultkrantz & Lindberg (2011); Mortimer, Wijnands, Harris, Tapp & Stevenson (2018) and Mullen, Maxwell & Bédard (2015).

messages) to ensure that participants remain engaged throughout the study and are inconvenienced minimally. It is also recommended that the incentive structure employed is designed in such a way as to realistically reflect the magnitude of incentives offered by actual UBI policies.

As alluded to in Section 7.1, UBI policies may be of interest to commercial vehicle owners and fleet managers as a means to monitor- and potentially improve the driving behaviour of employees. The mere awareness of being monitoring and the associated threat of being reprimanded might be enough to induce responsible driving among employees, however, it may also be beneficial for employers to implement incentive programmes based on employees' driving behaviour. As such, a field experiment involving a large-scale employer may be worth pursuing. If one intends to focus purely on the impact of feedback and/or incentives on employees' driving behaviour (i.e., not necessarily the potential impact of merely monitoring employees), an ideal corporate candidate would be one that already has driver monitoring devices installed in its fleet. In addition to eliminating the resources associated with the installation of devices, this approach could potentially remove the need for an initial monitoring phase that would otherwise be used to establish driver profiles for each participant. Moreover, by selecting a group of participants that are already being monitored as part of their usual duties, this approach *could* mitigate the threat of self-selection bias.

Although the merits of field experiments of this nature are apparent, their resource-intensive nature and the potential for participant attrition may result in limited usable samples (Elvik, 2014). In addition, self-selection bias among participants may limit the generalisability of the results obtained from a study of this nature. Similarly, participants may adjust their driving behaviour during the initial baseline period merely because they are aware that they are being monitored, meaning that the driving data obtained during this period may not, in fact, truly represent participants' normal driving behaviour[84]. Because the proposed field experiment would take place in a less controlled environment than the proposed simulator study, the field experiment may also be exposed to extraneous factors with the potential to confound results.

An alternative approach to the proposed simulator study and field experiment might include an investigation into the claims records of UBI policyholders. An apparent advantage of this approach would be its use of existing data. If this approach is followed, the claims history of each sampled policyholder from before subscribing to their UBI policy would be compared to that recorded after their subscription. Similarly, to monitor the effect of UBI on policyholders' driving behaviour over time, the driving data obtained from a particular policyholder during a specified timeframe could be compared against their own driving data from another defined period. In other words, before-versus-after comparisons would be made between each driver's own driving data. Alternatively, one might adopt a

[84] It is possible that the combination of a relatively long baseline period and a discreet monitoring device could limit the potential effect of this behavioural bias.

with-versus-without experiment design by investigating the observed claims histories linked to different vehicles owned by the same client in instances in which the vehicles are covered by different types of policies (i.e., traditional insurance and UBI). Acquiring an appropriate dataset for this type of study design might, however, prove challenging.

7.5 Quantification of the Benefits and Costs of Usage-Based Insurance

UBI is regularly posited to deliver benefits for insurers, policyholders and broader society, as outlined in Section 2.2.2. While the broader economic benefits of UBI may be apparent, it is worth noting that only a fraction of the total benefits of these policies accrues to insurers. As such, it is possible that the introduction of UBI policies may be *economically* attractive from a societal perspective while simultaneously being *financially* unattractive from the perspective of an insurer—particularly over the short-term, when traditional insurance remains the industry norm. Without government inducement, traditional insurers that do not foresee profitability from potential UBI products may not be interested in entering the UBI domain. For the state to offer insurers incentives in exchange for the introduction of UBI policies, it would have to be convinced of the economic merits thereof. To this end, it is recommended that attempts are made to prospectively quantify the economic benefits and costs associated with UBI in the South African context so that a localised economic appraisal can be performed.

Because the total magnitude of the economic impacts associated with UBI policies would be influenced by the extent of their proliferation, it is suggested that this proposed study considers multiple possible UBI uptake trajectories based on various situational factors (e.g., *trajectory without mandatory property insurance*, *trajectory with compulsory property insurance*, *trajectory if motorists were guaranteed discounts for UBI subscription* or any combination thereof).

It is, however, only recommended that an appraisal of this nature is conducted after more is known about the impacts of usage-linked incentives on individuals' driving behaviour—particularly in the local context—as this would fundamentally affect the inputs of such an appraisal. Similarly, it is recommended that the perceptions of local insurers are probed before undertaking a study of this nature, as industry-wide positivity towards UBI may rule out the need for government inducement. In this case, it is recommended that a retrospective economic appraisal is performed after UBI is widely available, as this would place less reliance on forecasting effects that are largely uncertain.

8 CONCLUSIONS

There is little doubt that efforts aimed at relieving the plight of road accidents in South Africa deserve prioritisation. Among the causes of road accidents, human factors contribute starkly. An apparent disconnect exists between the nation's credible road safety laws and poor road safety outcomes, which may, in part, be the result of unfitting norms and values relating to the behaviour of road users (Du Plessis *et al.*, 2020:4). As such, interventions aimed at improving the manner in which motorists drive should be a cornerstone in mitigating the physical-, emotional- and economic trauma triggered by avoidable road accidents. In addition, because motorists do not currently bear the full set of social costs associated with road transport, some costs are typically not integrated into their travel decisions. This ultimately results in over-utilisation and the production of external costs. Because of the presence of external costs—of which accident costs are included—interventions that bring about an improved allocation of resources within the transport sector by better reflecting the user-pays principle are commonly prescribed by policymakers. One such intervention posited to achieve both a reduction in the extent of vehicle use and an improvement in the driving behaviour of motorists involves the widespread adoption of UBI policies and the taxation thereof.

8.1 Final Remarks Relating to UBI in the Current Insurance Arrangement

Increasingly affordable telematics technology, the proliferation of smartphones and a broadening desire to incorporate data-driven approaches into rate-making have sparked interest in UBI propositions among insurers across the globe. Despite the prominence of these policies in parts of the developed world, the South African short-term insurance industry as a whole has been somewhat sluggish in its introduction of UBI policies. In contexts with mature UBI offerings, the uptake of these policies has been largely driven by young motorists, who would otherwise typically face relatively costly premiums. Typified by lifelong exposure to digital technologies, it has been said that this segment possesses abilities, preferences and expectations that differ from those of more-mature cohorts. Accordingly, the study set out to explore the perceptions of UBI policies held by younger South African motorists, as well as to gauge this market segment's willingness and ability to adopt these more digitally-demanding policies. To this end, a market segment assessment survey was undertaken among a sample of 565 motorists between the ages of 18 and 34.

Based on the results of the survey, it would seem that modern UBI policies are unlikely to garner immediate- and universal preference over conventional vehicle insurance policies among younger drivers. When asked to indicate their level of interest in two types of UBI (i.e., one wherein the insurer monitors VKT only and the other wherein multiple aspects of driving behaviour are monitored), a clear majority of respondents were not necessarily opposed to subscribing, however, modal responses of "somewhat interested" in relation to both types of UBI did suggest a degree of hesitance. Between the two types of UBI, the VKT-only option amassed considerably less resistance—perhaps suggesting a

sense of reluctance towards more-comprehensive behaviour monitoring. Three sub-segments with varying levels of interest in UBI policies were identified and informally dubbed *Forerunners*, *Non-Partisans* and *Laggards*—a grouping that served as a basis for segmenting participants' responses to other questions.

Although the majority of participants utilised insured vehicles most regularly, more than half had no prior knowledge of the existence of UBI—a result observed among vehicle owners and non-owners alike. As such, an apparent need exists for insurers to bolster their efforts to familiarise this largely uninformed cohort with the concept of UBI and the potential benefits thereof. Based on the channel preferences observed by Accenture (2016), it would seem that digital methods should underpin insurers' efforts to reach this young segment.

Even though most owners of insured vehicles appeared confident in their knowledge of the costs associated with coverage, it emerged that a considerable share of respondents lacked a perceived understanding of how their premiums were determined by their insurer. UBI policies that provide clients with feedback on their driving behaviour could potentially allay this uncertainty and assist them in their efforts to achieve the behavioural changes required to bring about premium discounts—a topic explored in Section 5.7. Among drivers of insured vehicles with policies that had been changed within the last two years, the most commonly cited reason behind the change related to cost.

Even though the survey yielded largely mixed results from the questions relating to cost-consciousness, more than two-thirds of respondents were inclined to believe that their driving ability was deserving of lower premiums. This was not unexpected, given that more than 85 percent of respondents agreed—most with relatively strong conviction—that they were better-than-average drivers. This near-universal self-confidence was observed among all three sub-segments, perhaps suggesting that promoting UBI as "insurance for good drivers" may be an ideal approach to achieve broad consumer appeal. While tugging at these motorists' sense of confidence in their driving abilities may garner mass appeal, it is unlikely that all drivers would benefit from cheaper premiums under a UBI scheme. As such, the potential impact of unexpectedly high premiums on the churn rates of self-proclaimed excellent drivers should be probed.

Somewhat concerningly for UBI providers, almost half of all respondents were inclined towards flat-rate tariff structures for subscription services—even when the alternative variable structure was said to offer long-run cost savings. Somewhat surprisingly, Forerunners did not collectively elude this preference. While potential theoretical reasons for this preference are outlined in Section 5.4, it is recommended that further efforts are made to understand the phenomenon in the local insurance context among young drivers.

The survey also gauged the extent to which younger motorists believed that UBI could foster the creation of shared value by engendering VKT curtailment, improved speed limit compliance and cost savings. The results of numerous questions suggested that inducing widespread VKT curtailment may prove

challenging among all three sub-segments. For example, when asked to select the strategy that they would prioritise to reduce their VKT if they were to subscribe to a UBI policy, close to one-fifth of respondents indicated that they would not reduce their VKT at all. Somewhat concerningly, less than six percent of respondents indicated that they would make use of public transport more often as their primary means to reduce VKT. Despite most respondents revealing a willingness to use much-improved public transport, poor perceptions of existing state-provisioned options—particularly relating to their *reliability* and *safety and security*—suggested that these modes are not typically viewed as adequate alternatives to private vehicle use. Although the vast majority of respondents indicated that they did not like to rely on others for lifts, the most commonly selected strategy to achieve VKT curtailment was to share lifts more often. In a related question, more than 40 percent of respondents indicated that they would rely on lifts if their primary mode were to become unavailable. Accordingly, lift-sharing may represent a tolerable means to achieve some degree of VKT curtailment without having to utilise perceivably poor public transport.

The potential of UBI to encourage improved speed limit compliance—among both the respondents themselves and other motorists—was generally viewed with a strong level of belief. It was proposed that the differences between the group's sentiment towards the likelihood of achieving improved speed limit compliance and curtailed VKT could relate to perceptions of the relevance of each of these aspects of behaviour monitoring as well as the relative attainability of each type of behavioural change.

While most respondents—particularly those considered Forerunners—shared some degree of belief that subscribing to UBI would reduce the cost of coverage associated with their most-regularly used vehicles, more than half did select a rating scale value between four and seven—perhaps indicative of a degree of uncertainty. The group's collective sentiment towards the fairness of UBI policies was, however, more positive. Largely positive sentiment was also expressed among respondents when asked to indicate how strongly they believed that South African roads would become safer if the driving behaviour of all road users was monitored. Because this question made no suggestion of changing traffic regulations or altered incentive structures, it was proposed that poor perceptions of existing traffic law abidance and enforcement could have underpinned this sentiment.

The survey questions related to digital readiness and acceptance yielded largely favourable results for providers of modern UBI policies. Smartphone ownership among the sample was near-universal, and most smartphone users indicated that they were able to perform tasks that would be central to the use of mobile applications for driving behaviour monitoring. Relatedly, by confidently making use of either their smartphones or computers to perform banking transactions, most respondents appeared both willing- and able to utilise digital channels within the financial services sector. Although Forerunners typically displayed marginally less dispersion in response to the statements from this category, largely favourable results were obtained from all three sub-segments. As such, it would appear that

technological competence would not generally hinder the segment's ability to utilise modern UBI policies. Most respondents did, however, favour dedicated plug-in devices over smartphone applications as a means to monitor their driving behaviour. Because smartphone-based monitoring may have cost advantages over the alternative, it is recommended that further efforts are made to investigate the reasons for- and strength of this preference.

The survey also gauged perceptions relating to the relevance of an array of behaviour-based rate factors that are commonly utilised by providers of modern UBI policies. In addition, respondents were asked to indicate the level of (dis)comfort that they would ascribe to having each of these aspects of their driving behaviour monitored. In general, the Forerunner sub-segment had a more favourable outlook on all aspects of behaviour monitoring than their counterparts in terms of both relevance and comfort. Based on the group's average comfort- and relevance scores, it would appear that most respondents would be relatively amenable towards having their *in-vehicle cell-phone usage*, *speed* and *cornering* monitored by insurers. Conversely, consumers typically indicated a relatively poor understanding of why *location* should be monitored and generally felt less comfortable with this prospect. The questions relating to (dis)comfort generally yielded responses with a large degree of dispersion, perhaps suggesting that a noteworthy proportion of respondents might consider behaviour monitoring to be somewhat intrusive. Relatedly, most respondents—particularly those from the Laggard sub-segment—considered smartphone location monitoring to be an invasion of their privacy. To address these privacy concerns, providers of UBI should give consumers enough reason to believe that their behaviour monitoring practices are not overly intrusive and that policyholders' driving data are secure. On balance, consumers should be convinced that the benefits of having their driving behaviour monitored far outweigh the unease that they may attach to their concerns over privacy.

After the market segment assessment survey, Chapter 5 explored concepts from behavioural research with potential applicability to UBI product offerings. To this end, the chapter considered potential demand-side challenges relating to both consumer- adoption and retention that providers of UBI policies may face as a result of their variable tariff structure. For example, while variable premiums may encourage policyholders to plan their trips more prudently by offering an ongoing incentive to reduce one's VKT, the insurer runs the risk of increasing the salience of costs to an extent that is perceived to be insufferable. Because a large degree of variation can exist between different insurers' UBI products (in terms of both the policies themselves and the other components of their marketing mixes), a wide array of attributes need to be established prior to their launch. Different combinations of these attributes may lead to divergent uptake trajectories and levels of commercial viability. In addition, certain combinations of these attributes could influence the driving behaviour of policyholders to a greater extent than others—potentially engendering shared value that differs in both its magnitude and composition. As such, the findings of existing behavioural research were utilised to underpin suggestions relating to strategies and product attributes that may boost consumers' acceptance of UBI,

as well as the scope of shared value engendered by these policies. The chapter also highlighted potential conflicts that may arise between the outcomes of certain product attributes. For example, while more-comprehensive behaviour monitoring could translate to improved actuarial accuracy, it may also heighten costs and give rise to concerns relating to privacy.

For the foreseeable future, motorists in South Africa who opt to purchase property coverage will have the choice between an assortment of conventional- and UBI policies. As such, under the existing insurance arrangement, a key determinant of the success of UBI policies will likely relate to their ability to deliver consumer benefits. Accordingly, the chapter concluded that providers of UBI may be pressed to sacrifice some aspects of their preferred tariff structure in an effort to establish consumer preference.

8.2 Final Remarks on Potential Insurance Arrangements

In Chapters 4 and 5, UBI was explored principally in relation to property coverage, as South Africa's existing insurance arrangement confines this type of policy to property coverage alone. In the subsequent chapter, the perspective of the thesis shifted to that of the state and the focus was widened to consider the overarching insurance arrangement, which relates to both property- and personal injury coverage. An exploratory case study was undertaken to elucidate the core operational challenges associated with South Africa's existing road accident compensation arrangement, as well as those faced by some of the country's international counterparts as a result of their compulsory insurance arrangements. In addition, the case study explored state-initiated efforts to actively pursue compulsory insurance arrangements that better reflect drivers' individual risk profiles.

From an international perspective, South Africa's mandatory road accident insurance arrangement is anomalous in that it employs a hypothecated fuel levy as the primary funding source of a single state-run insurer with the responsibility of providing personal injury- and indemnity protection. In the nation's overarching vehicle insurance arrangement, all forms of property insurance are voluntary in nature and provisioned by the private sector. South Africa's state insurer, the RAF, has faced long-term financial instability and has been the focus of no less than nine commissions of inquiry. According to the entity itself, this instability is largely attributable to both its funding model and the claims environment in which it operates. A fundamental flaw of the funding model relates to its implied use of fuel consumption as a proxy for risk exposure, which obfuscates the relationship between the entity's revenues and expected expenditures and leads to a dubious reflection of the user-pays principle. Relatedly, general improvements in vehicle fuel efficiency and the seemingly inevitable uptake of non-ICE vehicles pose long-term threats to a funding source that is already both under-strain and of questionable fairness. As a result, the RAF's existing tariff structure appears to present funding challenges for the entity itself while offering inappropriate incentives for influencing driving behaviour. The government of New Zealand—one of only a handful of other nations to employ a fuel levy as its primary source of funding for a single state-run insurer—has acknowledged the inherent flaws associated with this method of

funding and has signalled its intention to adopt alternative approaches that better reflect risk. As such, without change, the RAF may soon find itself increasingly anomalous in the global context. In addition to the funding challenges posed by the largely arbitrary relationship between the RAF's revenue and expenditures, the lack of alternative insurance options for motorists may expose the entity to a larger degree of public scrutiny. In contexts in which mandatory insurance is provisioned by the private sector—as is the case in much of the rest of the world—motorists can typically choose their preferred insurer from an array of options. As such, motorists generally have the freedom to change their insurer if met with underwhelming service.

Along with the challenges associated with the RAF's funding model, the entity's ability to fulfil its mandate has been undermined by the litigious claims environment in which the fault-based accident compensation scheme operates. As a result, the claims process is often inaccessible to accident victims. Among those who are willing and able to submit claims and accept the associated uncertainty, victims typically face prolonged litigation and settlement periods. This is seemingly exacerbated by the RAF's alleged delay tactic of contesting claims that it has little chance of winning. While acting as a temporary survival strategy to ease short-term cash constraints, this approach ultimately inflates the entity's delivery costs. Moreover, the once-off- and all-encompassing nature of the RAF's compensation fails to reflect potential changes in the needs of accident victims, often leading to inappropriate compensation levels. In contrast, to promote independence and re-integration into the workforce, New Zealand's ACC places greater emphasis on rehabilitation and recovery than on financial settlements. This is partly the result of regular re-evaluation and flexibility relating to compensation. On balance, the RAF's current operating performance is indicative of an entity that has been forced to prioritise short-term survival over both long-term sustainability and the wellbeing of the victims that it exists to protect.

By exploring the overarching vehicle insurance regulations of the EU, as well as the insurance arrangement of China, Chapter 6 also elucidated interrelated decisions that South Africa's policymakers would have to make—as well as their repercussions—if the country were to adopt a similar arrangement. Many of these decisions have theoretical implications on *availability*, *affordability*, *deterrence* and *compliance*. For example, decisions relating to the type of mandated coverage (i.e., personal injury coverage, property coverage or both) as well as the bounds on coverage would need to be made—each with impacts on costs as well as the likelihood of compliance. Moreover, a change from the existing funding model to one that involves the payment of periodic risk-based premiums would forfeit the inherent universal compliance- and administrative simplicity associated with PATP funding. Consequently, a change of this nature would necessitate the establishment of a means to compensate accident victims involving uninsured drivers. In addition, without effective enforcement, low levels of compliance may beget relatively high premiums for compliant drivers. Furthermore, in an arrangement without inherent universal compliance, a stance would have to be taken on how the state would ensure that coverage is available for all drivers—regardless of their level of risk. Relatedly, the state would

need to establish the extent of control that it intends to maintain over insurance pricing. While handing complete pricing freedom to insurers allows the user-pays principle to be better reflected and creates a stronger incentive for risk mitigation among drivers, this approach may result in prohibitively expensive premiums among high-risk motorists, potentially undermining their likelihood of compliance. Conversely, a larger degree of state control aimed at ensuring universal affordability could render high-risk drivers unprofitable and, as a result, necessitate the recuperation of expected losses from lower-risk motorists by means of heightened premiums. As such, policyholders' premiums and any potential uniform taxes levied thereupon would generally not align with the user-pays principle. A departure from the existing mandatory insurance approach would also necessitate the formulation of new regulations or requirements for visiting motorists—potentially in the form of multilateral agreements that allow cross-border coverage or the sale of temporary coverage.

Chapter 6 exhibited the diverse nature of national insurance arrangements and, in doing so, emphasised that no single existing approach should be viewed as a silver bullet for addressing the external accident costs associated with private road-based transport. While much further research is needed before decisions are made, the new course for South Africa's vehicle insurance arrangement to follow should not necessarily be determined by means of simple replication, but should reflect the local context's nuances and intricacies. For example, given the widely-publicised nature of the RAF's underwhelming historical financial performance and low levels of public trust in the state (Edelman, 2021), it might be argued that attempts to institute new alternative state-run arrangements may be viewed with added scepticism—particularly if these alterations raise the perceived costs of vehicle use[85]. Relatedly, deep-rooted car dependence caused in part by the inadequacies of the existing public transport system (DoT, 2017d:2) may mean that insurance arrangements with higher costs could raise concerns over the affordability of mobility while stifling economic activity.

8.3 Closing Comments

From a societal perspective, an effective vehicle insurance arrangement and the associated taxation thereof allows a large share of the external accident costs otherwise tied to road-based transport to be internalised by ensuring that accident victims receive adequate- and timeous compensation and by deterring undesirable driving behaviour. In the South African context, the limited uptake of property insurance has combined with challenges relating to the state's provider of personal injury coverage to make for an overarching insurance arrangement that poorly reflects the user-pays principle and that allows a considerable share of accident costs to remain external. In the current personal injury coverage arrangement, discrepancies in the risk levels of motorists are reflected somewhat haphazardly by the use of fuel consumption as a proxy for risk. In the current property insurance arrangement, the small share of motorists that voluntarily purchase coverage face heightened premiums as a result of the risks

[85] Confirmatory research relating to this notion is, however, recommended, as outlined in Section 7.3.

imposed by those who opt to drive uninsured vehicles. Among this limited subset of motorists with property coverage, the conventional approach to rate-making also fails to reflect individual discrepancies in policyholders' revealed driving behaviour. In addition to these issues that relate to the magnitude of tariffs, motorists' combined insurance costs (i.e., those that relate to both personal- and property coverage) are incurred in formats that arguably fail to offer sufficient incentive for altered driving behaviour at the point at which driving decisions are ultimately taken. Consequently, it is unlikely that insurance is currently being utilised effectively as a means to encourage responsible driving behaviour.

By implicitly focussing primarily on compensation while ignoring the shortcomings of its somewhat arbitrary cost structures, the overarching South African insurance arrangement is generally reactive in nature and fails to capitalise on the proactive potential that UBI and the taxation thereof may hold in encouraging behavioural improvements. While widespread adoption of UBI policies—particularly those that effectively leverage incentives to incite behavioural change—may yield meaningful results in reducing accident- likelihood and severity, the magnitude of these benefits in the South African context may ultimately remain hemmed in unless fundamental alterations are made to the overarching insurance arrangement to allow usage-based principles to be incorporated into the tariff structures of both property coverage *and* personal coverage. A change of this nature may be imperative if the state intends to use economic incentives as a vehicle for moving the country back on course towards achieving its ambitious road safety targets.

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LIST OF APPENDICES

APPENDIX A: MARKET SEGMENT ASSESSMENT SURVEY

* Which province do you reside in? If you have places of residence in multiple provinces, please select the option that you consider to be your primary province of residence.

Select an option

* Which metropolitan- or local municipality of the Eastern Cape do you currently reside in? If you have places of residence in multiple municipalities, please select the option that you consider to be your primary municipality of residence.

Select an option

* Which metropolitan- or local municipality of the Free State do you currently reside in? If you have places of residence in multiple municipalities, please select the option that you consider to be your primary municipality of residence.

Select an option

* Which metropolitan- or local municipality of Gauteng do you currently reside in? If you have places of residence in multiple municipalities, please select the option that you consider to be your primary municipality of residence.

Select an option

* Which metropolitan- or local municipality of KwaZulu-Natal do you currently reside in? If you have places of residence in multiple municipalities, please select the option that you consider to be your primary municipality of residence.

Select an option

* Which local municipality of Limpopo do you currently reside in? If you have places of residence in multiple municipalities, please select the option that you consider to be your primary municipality of residence.

Select an option

* Which local municipality of Mpumalanga do you currently reside in? If you have places of residence in multiple municipalities, please select the option that you consider to be your primary municipality of residence.

Select an option

* Which local municipality of North West do you currently reside in? If you have places of residence in multiple municipalities, please select the option that you consider to be your primary municipality of residence.

Select an option

* Which local municipality of the Northern Cape do you currently reside in? If you have places of residence in multiple municipalities, please select the option that you consider to be your primary municipality of residence.

Select an option

A single question relating to the respondent's metropolitan/local municipality of residence would appear based on their primary province of residence.

* **Which metropolitan- or local municipality of the Western Cape do you currently reside in? If you have places of residence in multiple municipalities, please select the option that you consider to be your primary municipality of residence.**

Select an option

* **What gender do you identify as?**

- Male
- Female
- Non-binary
- Prefer not to answer.

* **What is your current age (in completed years)?**

Select an option

The respondent had the option to select "prefer not to answer".

* **What is your current employment status? (You may select more than one option, if applicable)**

- Employed full-time
- Employed part-time
- Studying full-time
- Studying part-time
- Retired
- Unemployed
- Prefer not to answer.
- Other:

* **How many cars do you currently own, lease or have regular access to?**

- 1
- 2
- 3
- 4
- 5
- 6+

* **Prior to the outbreak of COVID-19 in South Africa, how many kilometres did you personally travel in a usual week? Your best estimate will suffice.**

Answer text

Only numeric characters could be entered.

* **What mode of transport do you rely on most in your usual daily routine?**

- Private car
- Company car
- Carpool/Lift club
- Lift with my spouse/partner
- Non-motorised transport (such as walking, cycling or skateboarding)
- Minibus taxi
- Motorcycle/scooter
- Taxi cab
- E-hailing service (such as Uber or Bolt)
- Train (such as Metrorail or Gautrain)
- Regular bus service (such as Golden Arrow, PUTCO or MyCiTi)
- Other:

* **If the mode selected in the previous question were to become unavailable, which mode would you use?**

- Private car
- Company car
- Carpool/Lift club
- Lift with my spouse/partner
- Non-motorised transport (such as walking, cycling or skateboarding)
- Minibus taxi
- Motorcycle/scooter
- Taxi cab
- E-hailing service (such as Uber or Bolt)
- Train (such as Metrorail or Gautrain)
- Regular bus service (such as Golden Arrow, PUTCO or MyCiTi)
- Other:

* **On a scale of 1-10, how important are each of the following factors when choosing a transport mode?**

	Not important 1	2	3	4	5	6	7	8	9	Very important 10
Convenience and ease of access										
Safety and security										
Comfort										
Reliability										
Cost										
Travel time										
Flexibility										

* **When travelling to and from your usual daily responsibilities, do you usually travel alone or with another traveller, such as a colleague or family member?**

- ○ Alone
- ○ With another traveller
- ○ I do not need to leave home to complete my daily responsibilities

* **Please indicate the degree to which you agree with the following statements on a scale of 1-10, with 10 representing "strongly agree" and 1 representing "strongly disagree".**

	Strongly disagree 1	2	3	4	5	6	7	8	9	Strongly agree 10
My travel patterns remain close to constant each week.	○	○	○	○	○	○	○	○	○	○
I don't like to rely on others for lifts.	○	○	○	○	○	○	○	○	○	○
I enjoy driving.	○	○	○	○	○	○	○	○	○	○
I enjoy the flexibility that having access to a car provides.	○	○	○	○	○	○	○	○	○	○
I believe that I am a better-than-average driver.	○	○	○	○	○	○	○	○	○	○

* **On a scale of 1-10, how would you rate public transport in your area in terms of the following characteristics? Please select "Don't know" if you are unsure.**

	Poor 1	2	3	4	5	6	7	8	9	Excellent 10	Don't know
Convenience and ease of access	○	○	○	○	○	○	○	○	○	○	○
Safety and security	○	○	○	○	○	○	○	○	○	○	○
Comfort	○	○	○	○	○	○	○	○	○	○	○
Reliability	○	○	○	○	○	○	○	○	○	○	○
Value for money	○	○	○	○	○	○	○	○	○	○	○
Travel time	○	○	○	○	○	○	○	○	○	○	○
Flexibility	○	○	○	○	○	○	○	○	○	○	○

* **Please indicate the degree to which you agree with the following statements on a scale of 1-10, with 10 representing "strongly agree" and 1 representing "strongly disagree".**

	Strongly disagree 1	2	3	4	5	6	7	8	9	Strongly agree 10
If the quality of public transport in my area were to improve considerably, I would consider using public transport more often.	○	○	○	○	○	○	○	○	○	○
If the quality of public transport were to improve considerably, I would consider not using a car anymore.	○	○	○	○	○	○	○	○	○	○

* **Is the car that you drive most regularly currently insured?**
- Yes
- No
- Unsure

* **What type of insurance policy covers the car that you drive most regularly?**
- Comprehensive
- Third party, fire & theft
- Third party only
- Unsure
- Other:

This question would appear only if the respondent indicated that they drove an insured car most regularly.

* **Has the insurance policy that covers the car that you drive most regularly been changed at least once within the last two years?**
- Yes
- No
- Unsure

This question would appear only if the respondent indicated that they drove an insured car most regularly.

* **If you answered "Yes" to the previous question, was price an important reason behind this change?**
- Yes
- No
- Unsure

This question would appear only if the respondent indicated that the insurance policy that covered their most regularly-driven car had been changed within the last two years.

* **Who owns/leases the car that you drive most regularly?**
- Me
- My parent(s)/guardian
- My spouse/partner
- Another relative
- A friend
- My employer
- Other:

* **Who is responsible for choosing the insurance policy that covers the car that you drive most regularly?**
- Me
- My parent(s)/guardian
- My spouse/partner
- Another relative
- A friend
- My employer
- Other:

* **Would you be willing to change your current vehicle insurance policy if it meant that you would benefit from cheaper premiums?**
- Yes
- No

This question would appear only if “Me” was selected in the previous question.

* **What percentage saving on your current vehicle insurance premiums would be enough to convince you to change your policy? (For example, if 20 is selected, it would mean that you would be willing to change your insurance policy if it meant that you could save 20 percent or more on your monthly premiums)**

Select an option

This question would appear only if "Yes" was selected in the previous question.

* **Please indicate the degree to which you agree with the following statements on a scale of 1-10, with 10 representing "strongly agree" and 1 representing "strongly disagree".**

	Strongly disagree 1	2	3	4	5	6	7	8	9	Strongly agree 10
I know the exact cost of the insurance premiums on the car that I drive most regularly.	○	○	○	○	○	○	○	○	○	○
I understand how the insurance premiums on the car that I drive most regularly are determined by the insurer.	○	○	○	○	○	○	○	○	○	○
I believe that the current insurance premiums on the car that I drive most regularly are priced fairly.	○	○	○	○	○	○	○	○	○	○
I believe that the premiums on the car that I drive most regularly should be lower because of my driving ability.	○	○	○	○	○	○	○	○	○	○

This group of statements would appear only if the respondent indicated that they drove an insured car most regularly.

* **Please indicate the degree to which you agree with the following statements on a scale of 1-10, with 10 representing "strongly agree" and 1 representing "strongly disagree".**

	Strongly disagree 1	2	3	4	5	6	7	8	9	Strongly agree 10
I actively consider ways to reduce the costs of my travel.	○	○	○	○	○	○	○	○	○	○
When the price of fuel increases, I respond by driving less.	○	○	○	○	○	○	○	○	○	○
I don't mind if prices for subscription services such as insurance, internet and telephone vary from month-to-month if I am able to save money in the long-term.	○	○	○	○	○	○	○	○	○	○

Usage-based insurance (UBI), also commonly referred to as pay-as-you-drive- (PAYD), distance-based- and per-kilometre insurance, differs from traditional vehicle insurance policies in that premiums are influenced by the distance driven by the policyholder. Some insurers have taken this a step further by monitoring the manner in which policyholders' vehicles are driven. Factors that are usually monitored in these policies include speed, time of travel, rate of acceleration, sharpness of braking, sharpness of cornering, cell phone usage while driving and location.

* **Before reading the above, were you aware of UBI policies?**

- ○ Yes
- ○ No

* **Would you consider subscribing to a UBI policy where the insurer *only* monitors the distance that you drive?**

- ○ I am currently subscribed to a UBI policy of this nature.
- ○ I would definitely consider subscribing.
- ○ I would be somewhat interested in subscribing.
- ○ I would most likely not be interested in subscribing.
- ○ I would definitely not consider subscribing.

* **Would you consider subscribing to a UBI policy where the insurer monitors your driving distance *and* the manner in which your vehicle is driven (including speed, time & location of travel, acceleration, sharpness of braking, sharpness of cornering and cell phone usage while driving)?**

- I am currently subscribed to a UBI policy of this nature.
- I would definitely consider subscribing.
- I would be somewhat interested in subscribing.
- I would most likely not be interested in subscribing.
- I would definitely not consider subscribing.

* **On a scale of 1 to 10, how relevant do you think each of the following aspects of driving behaviour is in determining your level of driving risk?**

	Highly irrelevant 1	2	3	4	5	6	7	8	9	Highly relevant 10
Number of kilometres travelled	○	○	○	○	○	○	○	○	○	○
Rate of acceleration	○	○	○	○	○	○	○	○	○	○
Location of travel	○	○	○	○	○	○	○	○	○	○
Time of travel	○	○	○	○	○	○	○	○	○	○
Cell-phone usage while driving	○	○	○	○	○	○	○	○	○	○
Driving speed	○	○	○	○	○	○	○	○	○	○
Sharpness of braking	○	○	○	○	○	○	○	○	○	○
Sharpness of cornering	○	○	○	○	○	○	○	○	○	○

* **Which of the following strategies would you prioritise most to reduce the kilometres driven if you had a UBI policy?**

- Share lifts more often.
- Use public transport more often.
- Walk/Cycle more often.
- Use my other vehicles more often.
- Take fewer trips.
- I would not reduce my distance driven.
- Other:

* **Please indicate the degree to which you agree with the following statements on a scale of 1-10, with 10 representing "strongly agree" and 1 representing "strongly disagree".**

	Strongly disagree 1	2	3	4	5	6	7	8	9	Strongly agree 10
I believe that subscribing to a UBI policy would reduce the overall cost of insurance on the car that I drive most regularly.	○	○	○	○	○	○	○	○	○	○
I believe that I would drive less if the premiums on the car that I use most regularly were linked to my driving distance.	○	○	○	○	○	○	○	○	○	○
I believe that I would exceed the speed limit less often if the premiums on the car that I use most regularly would be decreased as a result.	○	○	○	○	○	○	○	○	○	○

This group of statements would appear only if the respondent indicated that they drove an insured car most regularly.

* **Please indicate the degree to which you agree with the following statements on a scale of 1-10, with 10 representing "strongly agree" and 1 representing "strongly disagree".**

	Strongly disagree 1	2	3	4	5	6	7	8	9	Strongly agree 10
I believe that UBI policies are fairer than traditional insurance policies because policyholders pay according to more accurate risk profiles.	○	○	○	○	○	○	○	○	○	○
I believe that South African roads would become safer if the driving behaviour of all road users was monitored.	○	○	○	○	○	○	○	○	○	○
I believe that other road users would exceed the speed limit less often if their insurance premiums would be decreased as a result.	○	○	○	○	○	○	○	○	○	○

* **Do you own a smartphone?**
  - Yes
  - No
  - I'm not sure if my cell phone is a smartphone.

* **Do you know how to switch the location settings on/off on your smartphone?**
  - Yes
  - No

* **Do you know how to download and update applications on your smartphone?**
  - Yes
  - No

These questions would appear only if the respondent indicated that they owned a smartphone.

* **Does the insurer that provides cover for the car that you use most regularly have a smartphone application?**
  - Yes
  - No
  - Unsure

* **Do you ever use this insurer's smartphone application?**
  - Yes
  - No

This question would appear only if the respondent indicated that they drove an insured car most regularly *and* owned a smartphone.

* **Do you use your smartphone and/or computer for personal banking?**
  - Yes
  - No

This question would appear only if the respondent indicated that they owned a smartphone.

* **Do you use your computer for personal banking?**
  - Yes
  - No
  - I do not own a computer

This question would appear only if the respondent *did not* indicate that they owned a smartphone.

* **On a scale of 1 to 10, how confident do you feel when completing banking transactions using your smartphone or computer?**

Very unsure — Very confident

1 2 3 4 5 6 7 8 9 10

This question would appear only if the respondent indicated that they used a smartphone or computer for personal banking.

* **If you were to subscribe to a UBI policy, would you prefer if your driving behaviour was monitored using a smartphone application or a dedicated plug-in device that stays in your car?**

- Smartphone application
- Plug-in device

* **On a scale of 1 to 10, how comfortable would you be with each of the following aspects of your driving behaviour being monitored by an insurer?**

	Very uncomfortable 1 2 3 4 5 6 7 8 9 10 Very comfortab
Number of kilometres travelled	
Rate of acceleration	
Location of travel	
Time of travel	
Cell-phone usage while driving	
Speed	
Sharpness of braking	
Sharpness of cornering	

* **Please indicate the degree to which you agree with the following statements on a scale of 1-10, with 10 representing "strongly agree" and 1 representing "strongly disagree".**

	Strongly disagree 1 2 3 4 5 6 7 8 9 10 Strongly agree
Smartphone applications that monitor the location of users are an invasion of privacy.	
I feel confident when making purchases online or via smartphone applications.	

* **Would you like to participate in a lucky draw for a chance to win one of three R500 cash prizes? Please note that this is not compulsory. If you opt in, you will be directed to a new page on which you will be asked to enter your email address.**

- Yes
- No

You have indicated that you would like to participate in the lucky draw. To be eligible to participate, you will be required to provide your email address so that winners can be contacted. Please note that your email address will not be linked to your responses to the survey. If multiple attempts to contact winners are unsuccessful, new winners will be randomly drawn. Once the prizes have been awarded successfully, all email addresses will be removed from the researcher's records.

* **Please enter your email address in the box below.**

Answer text

If a respondent indicated that they would like to participate in the lucky draw, they would be directed to a separate linked survey to provide their email address.

APPENDIX B: ELECTRONIC INVITATIONS

Dear Prospective Participant,

The Department of Logistics at Stellenbosch University would like to invite you to participate in a survey created to assess the readiness and willingness of motorists to adopt insurance policies which offer benefits to low-risk drivers, as determined by means of driver monitoring. The survey forms part of a Master's study on usage-based vehicle insurance conducted by Brandon Alexander Coetzer. Willing participants will be entered into a lucky draw to **win one of three R500 cash prizes.**

To be eligible to participate, you must either own or lease a private motorcar of your own or have regular access to a private motorcar that is owned or leased by someone else. Participants must also live in South Africa. The survey contains questions relating to participants' general travel patterns, perceptions of public transport, insurance price considerations, perceptions of usage-based insurance policies and usage of technology. There are no right or wrong answers. Completing the survey would take approximately **10 minutes**.

Your participation in the survey would be entirely voluntary. You would also be free to terminate your participation at any point in the survey, which would entail no negative implication to you whatsoever.

If you have any questions regarding the research itself, please feel free to contact the principal investigator at 19925328@sun.ac.za and/or the research supervisors, Prof. S.C. Krygsman at skrygsman@sun.ac.za & Prof. S. Du Plessis at sophia@sun.ac.za.

Your participation would be truly appreciated.

To take part in the survey, please click here.

Kind regards,
Brandon Alexander Coetzer

APPENDIX C: INFORMED CONSENT TEMPLATE

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jou kennisvennoot • your knowledge partner

CONSENT TO PARTICIPATE IN RESEARCH

Dear Prospective Participant,

The Department of Logistics at Stellenbosch University would like to invite you to participate in a survey created to assess the readiness and willingness of motorists to adopt insurance policies which offer benefits to low-risk drivers, as determined by means of driver monitoring. The results of the survey will contribute to the principal investigator's Master's degree in Transport Economics. Your participation in the survey would be entirely voluntary and you are free to decline to participate. You would also be free to terminate your participation at any point during the survey, which would entail no negative implication to you whatsoever. Completing the survey would take approximately ten minutes. The survey contains questions relating to participants' general travel patterns, perceptions of public transport, insurance price considerations, perceptions of usage-based insurance policies and usage of technology. There are no right or wrong answers.

Willing participants who complete the survey will be entered into a lucky draw and will stand a chance to win one of three R500.00 cash prizes. The lucky draw will take place in mid-December of this year. To be eligible for entrance into the lucky draw, participants will need to provide identification in the form of an email address. Participants' email addresses will not be linked to their survey responses, allowing anonymity to be upheld.

RIGHTS OF RESEARCH PARTICIPANTS

You would not waive any legal claims or rights by participating in the survey. You would also have the right to decline to answer any questions in the survey and to exit the survey at any time without providing a reason. Your information and your responses to the survey would be protected and no information obtained during the study would be traceable to a specific participant. In addition, the researcher will only publish the aggregated results. Only the researcher will have access to the results. If you have any questions regarding your rights as a research participant, please feel free to contact Mrs. M. Fouché at the Division for Research Development at mfouche@sun.ac.za or 021 808 4622.

If you have any questions regarding the research itself, please feel free to contact the principal investigator, Mr B.A. Coetzer at 19925328@sun.ac.za and/or the research supervisors, Prof S.C. Krygsman at skrygsman@sun.ac.za & Prof. S. Du Plessis at sophia@sun.ac.za.

Please do feel free to print a copy of this text.

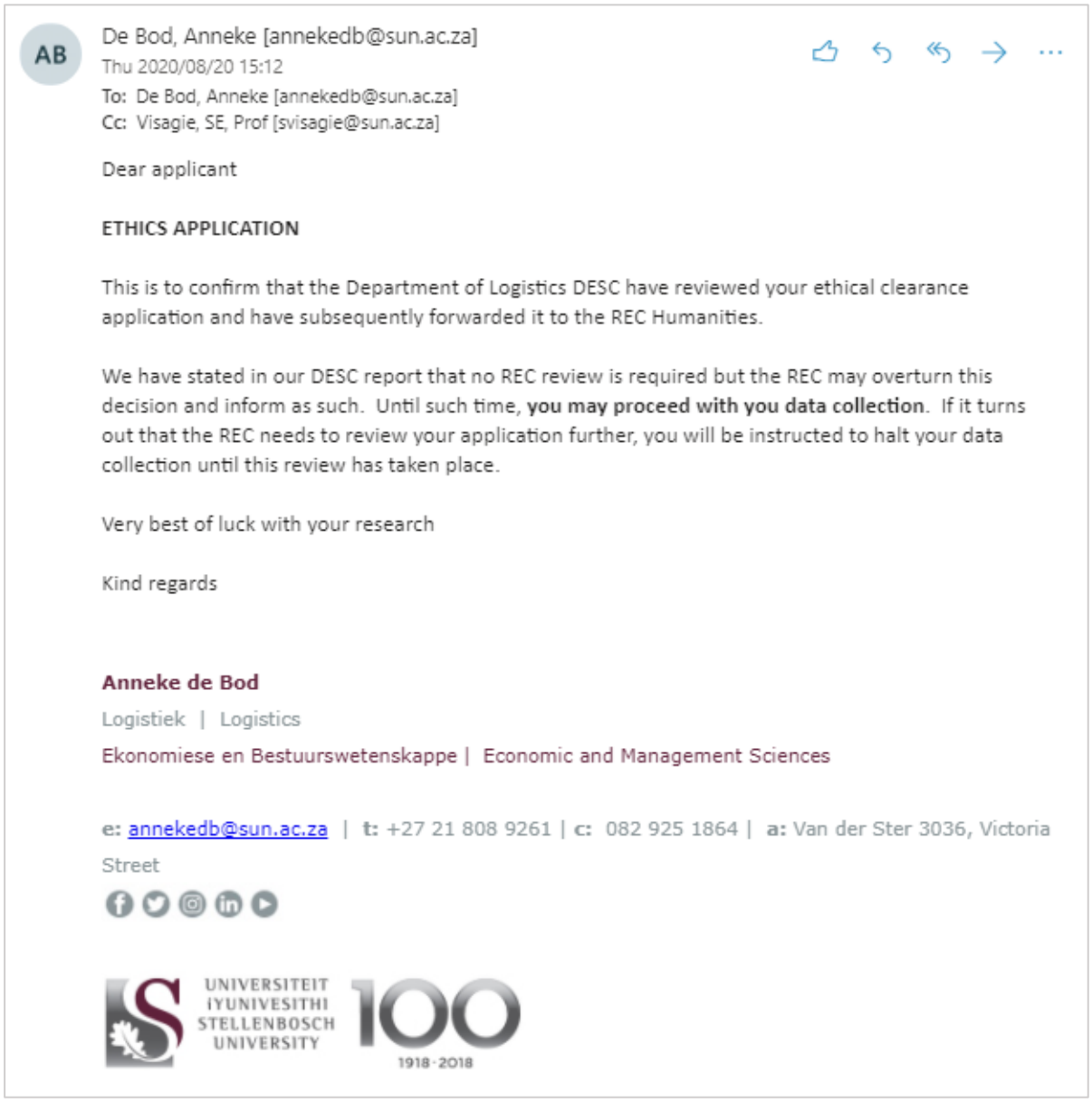
Have you read the above and do you agree to participate in the survey?

- I have read and understood the above information and agree to participate in the survey.
- I do not agree to participate in this survey.

This survey is specifically aimed at motorists who either own or lease a private motorcar of their own or have regular access to a private motorcar that is owned/leased by someone else. Only individuals who reside in South Africa are eligible to participate. Do you meet these criteria?

- Yes, I do meet these criteria.
- No, I do not meet these criteria.

APPENDIX D: PROOF OF ETHICAL CONSIDERATION



AB

De Bod, Anneke [annekedb@sun.ac.za]
Thu 2020/08/20 15:12
To: De Bod, Anneke [annekedb@sun.ac.za]
Cc: Visagie, SE, Prof [svisagie@sun.ac.za]

Dear applicant

ETHICS APPLICATION

This is to confirm that the Department of Logistics DESC have reviewed your ethical clearance application and have subsequently forwarded it to the REC Humanities.

We have stated in our DESC report that no REC review is required but the REC may overturn this decision and inform as such. Until such time, **you may proceed with you data collection**. If it turns out that the REC needs to review your application further, you will be instructed to halt your data collection until this review has taken place.

Very best of luck with your research

Kind regards

Anneke de Bod
Logistiek | Logistics
Ekonomiese en Bestuurswetenskappe | Economic and Management Sciences

e: annekedb@sun.ac.za | t: +27 21 808 9261 | c: 082 925 1864 | a: Van der Ster 3036, Victoria Street

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NOTICE OF APPROVAL

REC: Social, Behavioural and Education Research (SBER) - Initial Application Form

27 August 2020

Project number: 16916

Project Title: Usage-Based Insurance: Nudging Towards Responsible Driving

Dear Mr Brandon Coetzer

Your REC: Social, Behavioural and Education Research (SBER) - Initial Application Form submitted on 12 August 2020 was reviewed and approved by the REC: Social, Behavioural and Education Research (REC: SBE).

Please note below expiration date of this approved submission:

Ethics approval period:

Protocol approval date (Humanities)	Protocol expiration date (Humanities)
27 August 2020	26 August 2023

SUSPENSION OF PHYSICAL CONTACT RESEARCH DURING THE COVID-19 PANDEMIC

Due to the Covid-19 pandemic and resulting lockdown measures, all research activities requiring physical contact or being in undue physical proximity to human participants has been suspended by Stellenbosch University. Please refer to a formal statement issued by the REC: SBE on 20 March for more information on this.

This suspension will remain in force until such time as the social distancing requirements are relaxed by the national authorities to such an extent that in-person data collection from participants will be allowed. This will be confirmed by a new statement from the REC: SBE on the university's dedicated Covid-19 webpage.

Until such time online or virtual data collection activities, individual or group interviews conducted via online meeting or web conferencing tools, such as Skype or Microsoft Teams are strongly encouraged in all SU research environments.

If you are required to amend your research methods due to this suspension, please submit an amendment to the REC: SBE as soon as possible. The instructions on how to submit an amendment to the REC can be found on this webpage: [instructions], or you can contact the REC Helpdesk for instructions on how to submit an amendment: applyethics@sun.ac.za.

GENERAL REC COMMENTS PERTAINING TO THIS PROJECT:

INVESTIGATOR RESPONSIBILITIES

Please take note of the General Investigator Responsibilities attached to this letter. You may commence with your research after complying fully with these guidelines.

If the researcher deviates in any way from the proposal approved by the REC: SBE, the researcher must notify the REC of these changes.

Please use your SU project number (16916) on any documents or correspondence with the REC concerning your project.

Please note that the REC has the prerogative and authority to ask further questions, seek additional information, require further modifications, or monitor the conduct of your research and the consent process.

CONTINUATION OF PROJECTS AFTER REC APPROVAL PERIOD

You are required to submit a progress report to the REC: SBE before the approval period has expired if a continuation of ethics approval is required. The Committee will then consider the continuation of the project for a further year (if necessary).

Once you have completed your research, you are required to submit a final report to the REC: SBE for review.

Included Documents:

Document Type	File Name	Date	Version
Budget	BUDGET	16/07/2020	1
Recruitment material	ELECTRONIC INVITATION	16/07/2020	1
Data collection tool	MARKET ASSESSMENT SURVEY	17/07/2020	1
Data collection tool	FIELD EXPERIMENT METHODOLOGY AND OUTLINE	17/07/2020	1
Proof of permission	Km Based RUC HOD signed subm Jul 18	17/07/2020	1
Proof of permission	Pending request for internal institutional permission	17/07/2020	1
Default	COVID-19 RISK MITIGATION STRATEGY	17/07/2020	1
Informed Consent Form	INFORMED CONSENT TEMPLATE	08/08/2020	2
Research Protocol/Proposal	PROPOSAL VERSION 2- Usage-Based Insurance- Nudging Towards Responsible Driving	08/08/2020	2
Default	RESPONSE LETTER- VERSION 1	08/08/2020	1

If you have any questions or need further help, please contact the REC office at cgraham@sun.ac.za.

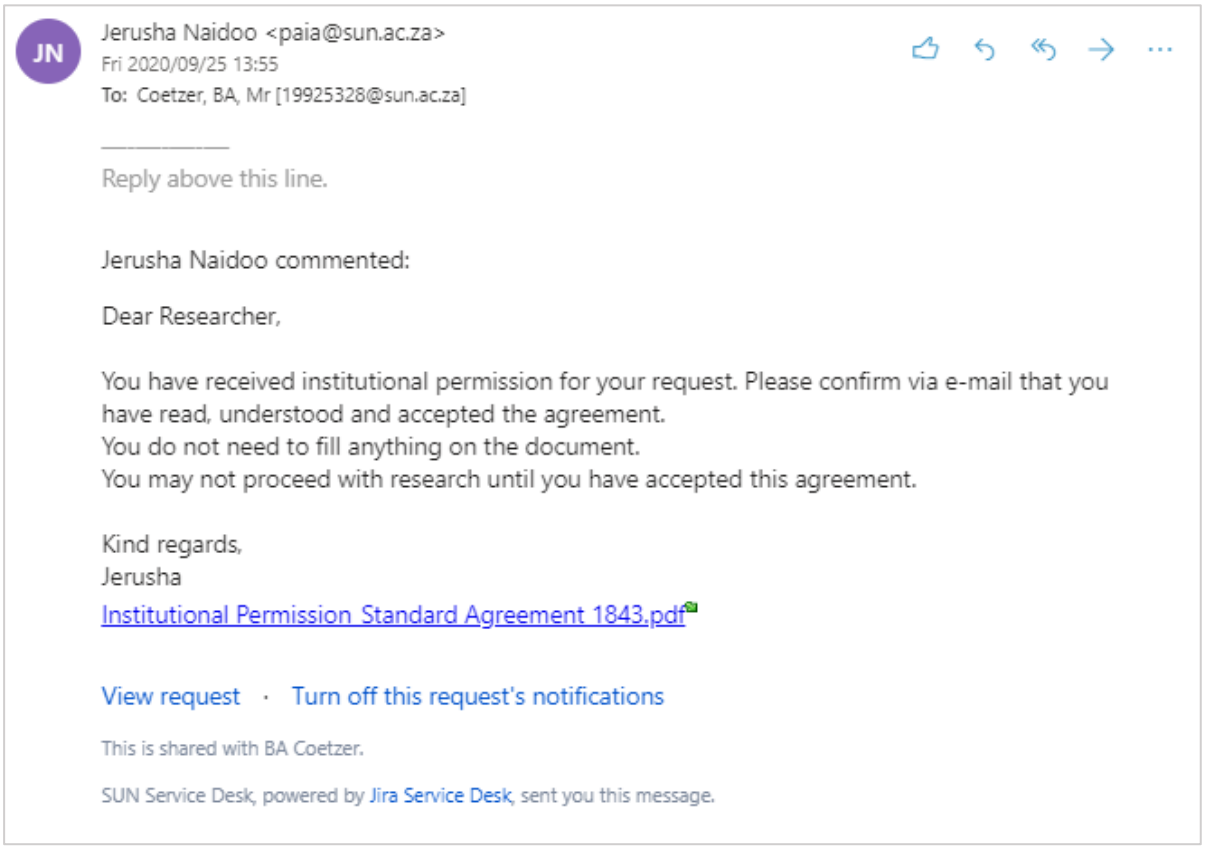
Sincerely,

Clarissa Graham

REC Coordinator: Research Ethics Committee: Social, Behavioral and Education Research

National Health Research Ethics Committee (NHREC) registration number: REC-050411-032.
The Research Ethics Committee: Social, Behavioural and Education Research complies with the SA National Health Act No.61 2003 as it pertains to health research. In addition, this committee abides by the ethical norms and principles for research established by the Declaration of Helsinki (2013) and the Department of Health Guidelines for Ethical Research: Principles Structures and Processes (2nd Ed.) 2015. Annually a number of projects may be selected randomly for an external audit.

APPENDIX E: PROOF OF INTERNAL INSTITUTIONAL PERMISSION



JN

Jerusha Naidoo <paia@sun.ac.za>
Fri 2020/09/25 13:55
To: Coetzer, BA, Mr [19925328@sun.ac.za]

Reply above this line.

Jerusha Naidoo commented:

Dear Researcher,

You have received institutional permission for your request. Please confirm via e-mail that you have read, understood and accepted the agreement.
You do not need to fill anything on the document.
You may not proceed with research until you have accepted this agreement.

Kind regards,
Jerusha
Institutional Permission_Standard Agreement 1843.pdf

View request · Turn off this request's notifications

This is shared with BA Coetzer.

SUN Service Desk, powered by Jira Service Desk, sent you this message.

APPENDIX F: MARKET ASSESSMENT SURVEY: RESOLUTIONS FOR DATA ISSUES AND CATEGORISATION OF OPEN-ENDED RESPONSES

Response ID	Variable label	Open-ended response obtained	Resolution
1163285	Q16_8	"Study and work"	Assume respondent studies- and works part-time
1163291	Q16_8	"Unemployed, Student"	Assume respondent is a full-time student with no employment
1164654	Q16_8	"Employed full-time, Employed part-time, Studying full-time, Freelancing"	Assume respondent is a full-time student with part-time employment
1165130	Q16_8	"Self-employed"	Assume respondent works full time
1165925	Q16_8	"Self-employed"	Assume respondent works full time
1166993	Q16_8	"Studying part-time, Fixed term contract"	Assume respondent studies- and works part-time
1163469	Q18	15.03	Change decimal to comma
1164989	Q18	20.00	Change decimal to comma
1166376	Q18	15.03	Change decimal to comma
1167093	Q18	20.03	Change decimal to comma
1167320	Q18	20.00	Change decimal to comma
1163068	Q18	59.5	Change decimal to comma
1162706	Q19	"Walking (I lived near campus)"	Respondent should have selected response 5 (i.e., non-motorised transport)
1162728	Q19	"Bicycle"	Respondent should have selected response 5 (i.e., non-motorised transport)
1163591	Q19	"Walking"	Respondent should have selected response 5 (i.e., non-motorised transport)
1162612	Q20	"Walk"	Respondent should have selected response 5 (i.e., non-motorised transport)
1162920	Q20	"Walking"	Respondent should have selected response 5 (i.e., non-motorised transport)
1162996	Q20	"Lift with my family"	Respondent should have selected response 3 (i.e., carpool/lift club)
1163778	Q20	"Lift from parents/sister or Uber"	Respondent should have selected response 3 (i.e., carpool/lift club)
1163828	Q20	"Bicycle"	Respondent should have selected response 5 (i.e., non-motorised transport)
1163911	Q20	"Bicycle"	Respondent should have selected response 5 (i.e., non-motorised transport)
1164251	Q20	"Lift with friends or family"	Respondent should have selected response 3 (i.e., carpool/lift club)
1164654	Q20	"Depending on how long I am without a car, I will either use e-hailing or rent a car"	Assume respondent would use an e-hailing service.
1164923	Q20	"Friends"	Respondent should have selected response 3 (i.e., carpool/lift club)

1165832	Q20	"Lift with parent"	Assume respondent would share a lift with friends. Response 3 (i.e., carpool/lift club)
1166376	Q20	"family *(sic)* members car"	Respondent should have selected response 1 (i.e., private car)
1166901	Q20	"Would use relative's car, or motorbike or walk, depending on where I want to go."	Assume respondent would use another private car.
1167398	Q20	"walking"	Respondent should have selected response 5 (i.e., non-motorised transport)
1167485	Q20	"Family and/or friends"	Assume respondent would share a lift with family/friends. Response 3 (i.e., carpool/lift club)
1169680	Q20	"Other vehicle"	Assume respondent would use another private car.
1163582	Q44	"2 year mechanical parts warranty that we chose for the 2nd hand car"	Incorrect response. Assume vehicle is not insured. Change response of Q43 to 2 and remove potential responses to all questions that only insured drivers were supposed to answer.
1163151	Q47	"Uber"	Uncertain whether this respondent is a driver. Remove all responses from this respondent.
1163713	Q47	"The car is in my name but my parents bought it"	Respondent should have selected response 1 (i.e., the respondent themselves)
1167168	Q50	"100"	The respondent indicated that a 100 percent saving would be required to incite them to change their policy. Because a saving of this degree is implausible, it was assumed that the respondent would not be willing to change policy to obtain premium reductions. Q49 changed to 2 (i.e., "No") and Q50 changed to a blank response.
1163402	Q69	"I won't drive any less"	Respondent should have selected response 6 (i.e., would not reduce VKT)
1167205	Q69	"Adjust my routes more"	Assume that respondent would plan their routes more prudently so that fewer trips are necessary. Change to response 5 (i.e., take fewer trips)
1167398	Q69	"cancel UBI policy"	Assume that the respondent is unwilling to reduce VKT. Change to response 6 (i.e., would not reduce VKT)
1168253	Q69	"My commute requires me to get to class, I have no control ofer *(sic)* that, but I do want to move closer."	Assume that the respondent is unable to reduce VKT. Change to response 6 (i.e., would not reduce VKT)

APPENDIX G: TABULATED RESULTS OF CHI-SQUARE TESTS

Description	Grouping	Number of observations				Result of test for association
		Forerunners	Non-Partisans	Laggards	Total	
Age	22 or below	98	119	96	313	$\chi 2$ (2, N=565) = 0.45, p=0.80
	Above 22	85	90	77	252	
Gender that the respondent identifies as.	Male	67	89	84	240	$\chi 2$ (2, N=562) = 5.23, p=0.07
	Female	115	119	88	322	
Does the respondent own the vehicle that they use most regularly?	Yes	62	60	53	175	$\chi 2$ (2, N=565) = 1.23, p=0.54
	No	121	149	120	390	
Type of municipality that the respondent lives in.	Metropolitan	95	115	89	299	$\chi 2$ (2, N=565) = 0.60, p=0.74
	Local	88	94	84	266	
How many cars does the respondent own, lease or have regular access to?	One	134	150	120	404	$\chi 2$ (2, N=565) = 0.66, p=0.72
	More than one	49	59	53	161	
Does the respondent hold some form of employment?	Yes	49	33	40	122	$\chi 2$ (2, N=565) = 7.30, p=0.03, V = 0.11
	No	134	176	133	443	
Annual VKT	Less than or equal to 20,000 km	176	190	152	518	$\chi 2$ (2, N=565) = 8.32, p=0.02, V=0.12
	More than 20,000 km	7	19	21	47	
Is the car that the respondent drives most regularly currently insured?	Yes	169	171	157	497	$\chi 2$ (4, N=565) = 16.39, p=0.003, V=0.12
	No	13	23	11	47	
	Unsure	1	15	5	21	
Is the respondent responsible for making insurance decisions? (Among drivers of insured vehicles)	Yes	37	26	32	95	$\chi 2$ (2, N=497) = 2.39, p=0.26
	No	132	145	125	402	
Type of policy that covered the car that the respondent used most regularly. (Among drivers of insured vehicles who knew what type of coverage the vehicle that they used most regularly had)	Comprehensive	102	91	98	291	$\chi 2$ (4, N=356) = 3.18, p=0.53
	Third party, fire & theft	18	11	8	37	
	Third party only	10	9	9	28	
Was the respondent willing to change insurance policy to achieve premium savings? (Among insured respondents who were responsible for making insurance decisions)	Yes	32	19	24	75	$\chi 2$ (2, N=95) = 2.10, p=0.35
	No	5	7	8	20	

Was the respondent aware of the existence of UBI?	Yes	85	69	79	233	$\chi 2$ (2, N=565) = 9.28, p=0.01, V=0.13
	No	98	140	94	332	
Does the respondent make use of their insurer's smartphone application? (Among insured vehicle owners who were aware that their insurer had a smartphone application)	Yes	21	7	11	39	$\chi 2$ (2, N=70) = 4.52, p=0.10
	No	9	10	12	31	
Does the respondent make use of digital channels for personal banking transactions?	Yes	173	199	164	536	$\chi 2$ (2, N=565) = 0.10, p=0.95.
	No	10	10	9	29	