LUND UNIVERSITY
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Acceptability of Vehicle Mileage Taxation in Sweden

A Behavioral Economics Approach to Introducing Road Policy Reforms

by

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Abstract Vehicle Mileage Taxation is a proposed improvement to addressing external costs of driving. A key hurdle for its implementation is its acceptability by the public. Theories of psychological reactance, fairness perception and status quo bias are explored as influences on tax reform perception. Data, representative for Sweden, was collected from 407 individuals in an online survey. A framing experiment investigated influences of policy communication on acceptability and its determinants through structural equation modeling. A choice experiment tested acceptability of different reform proposals over the status quo. The acceptability of introducing vehicle mileage taxation is found to depend on its perceived fairness, the arousal of psychological reactance and its tax rates, but not on the framing used to communicate the reform proposal.

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Leading statements and
propaganda as usual
when discussing environment
— Anonymous Survey Participant

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Chapter 1

Introduction

Knowing and acting upon one's knowledge are separate capabilities of humans. Just how distinct they are perhaps becomes most urgently apparent in humanity's response to the climate crisis. The drastic changes human activity brings to our planet have been established beyond doubt and most countries recognize the challenges facing humanity and have vowed to act upon them. Yet, effective actions – much less results – are embarrassingly unobservable (Victor et al., 2017).

Politicians like to stress the importance of political and economical feasibility when providing arguments for the divergence between set goals and realized policy (Anderson, Böhmelt, & Ward, 2017).

Political feasibility translates into balancing the interests of different groups, of which the public is a pivotal one. Few environmental policies entice vocal opposition from the public on the level of regulatory proposals for personal transport. The French gilets jaunes movement immediately comes to mind, with fierce protests against a proposed fuel tax increase, which protesters perceived as unfair and infringing upon personal freedom (Grossman, 2019).

Instruments designed for environmental and economic purposes can therefore gain from incorporating insights from other disciplines in designing effective policy. Fairness and infringement on freedom are deeply embedded in social psychology and behavioral economics, from which this thesis inherits its theoretical footing. They are applied in an empirical study on car usage policy and its acceptability.

Cars may pose an extraordinarily explosive topic as they embody most facets of the modern world. They are a tool for economic activity, social participation and status, but also possess large negative externalities (Winston & Shirley, 2010). At the same time, car ownership for many is a highly emotionalized and desirable prospect, long being heralded as freedom incarnated (Steg, 2005).

The advent of new types of propulsion systems, which are either more fuel efficient or make do without fossil fuel, requires new approaches by society to address, manage and distribute the burdens caused by negative externalities. Holistic, widely implemented economic instruments are currently hard to find, not only in Sweden, or Europe, but worldwide (Van Dender, 2019).

For a government, this provides a dilemma. Less conventional cars are needed to meet climate protection goals, but at the same time, these cars provide an effective way of revenue generation for state treasuries.

One potential solution to the fiscal challenges arising from phasing out fossil-fueled cars is changing the way driving is taxed. Instead of taxing the consumption

of fuel, the consumption of mileage could become the instrument of choice.

A vehicle mileage tax does exactly what its name suggests. The base for taxation is the actual driving distance instead of the proxy fuel consumption.

Other forms of road pricing also exist, usually in the form of tolls (Iseki & Demisch, 2012). They can be either applied to a specific type of infrastructure (e.g., turnpikes, express lanes, highway vignettes), a certain area (e.g., city cordons), or vehicle types (e.g., truck tolls).

A vehicle mileage tax is different from these road pricing schemes because it can feasibly combine their strengths while mitigating their weaknesses. Advances in tracking technology make it possible to assess the location of a driven distance without threatening data privacy (Duncan & Graham, 2013; Tsekeris & Voß, 2009). Thus, driving can be accurately priced in accordance to time and location without being limited to a confined area, which could otherwise cause toll-avoidance traffic (Van Dender, 2019). For policy makers, this opens possibilities for reforming vehicle use taxation; not only can the revenue loss of phasing out fossil cars be compensated, the tax burden associated with external costs of driving can be assigned more appropriately to those responsible (Duncan & Graham, 2013; Hennlock, 2020).

1.1 Research Problem

Transport economists overwhelmingly agree that road pricing in general is superior to other taxation models in allocating the scarce resource road use. Despite decades of research, the question "[w]hy is the world reluctant to do the obvious" (Lave, 1995, p. 465) remains.

Two research questions can be subsumed:

1. If a vehicle mileage tax is economically favorable over other road pricing mechanisms, what characteristics of the tax are conductive to its introduction?

2. How can policy be introduced so that it becomes politically feasible? Concretely for the case of a vehicle mileage tax, what can be done that the public accepts the reform?

1.2 Aim and Scope

The aim of this thesis is two-fold. On the practical side, this research first and foremost aims to inform policy makers in Sweden on the acceptability of the implementation of a vehicle mileage tax. It provides a general overview over the acceptability of such a reform, as well as important policy design to consider when implementing such a tax system. Policy makers are further addressed with the investigation into how different communication approaches, among which are the popular tax versus subsidy framing, affect potential voters.

On the academic side, this thesis aims to contribute an additional piece to the puzzle of answering the Lave's question (1995) by introducing insights from social psychology, most prominently psychological reactance theory (S. S. Brehm & Brehm, 1981), to existing models of transport policy acceptance. The insights are empirically tested by a behavioral economics informed online survey, consisting of

a framing experiment and a choice experiment. Thus, this thesis speaks to a number of different research fields. Most prominently to transport policy research, but also to the bigger context of environmental policy. Sustainable transition scholars might find insights into change resistance informative, and lastly, communication researchers and social psychologists find well established concepts from their fields applied to policy research.

1.3 Outline of the Thesis

Drawing from different strands of research poses the risk of becoming lost in various related concepts, theories and applications. In hopes of facilitating the orientation in the different domains, the thesis structure is outlined as such:

First, existing literature is reviewed. A general overview of challenges in addressing external costs of driving and different proposed solutions is presented as a baseline of policy options. Next, insights into the acceptability of different road pricing instruments are discussed broadly, before the Swedish experience with one such solution – congestion tolls using area cordons in the cities Stockholm and Gothenburg – are presented. The theoretical approach focuses on determinants of road pricing acceptability. First, fairness is examined from different angles; thereafter, infringement of freedom is enriched with psychological reactance theory.

Potential influences of change salience, language, and cognitive misrepresentations in decision making lead to the development of hypotheses aimed at answering the research questions.

Data collection is discussed before the methods used to test the hypothesis, including their theoretical foundation and limitations are discussed in depth.

This culminates in the statistical analysis of data collected from a representative sample of Sweden.

Ultimately, a conclusion of research findings attempts to generate insights of both practical relevance for policy makers and theoretical substance to researchers.

Chapter 2

Theory

2.1 Addressing External Costs of Driving

Few goods represent the delicate balance of trade-offs between benefits and costs as well as automobiles. They provide considerable advantages to individuals and the public alike and have become an integral part of life in most, if not all, countries.

Unfortunately, there is no free lunch. The benefits of driving come at a price. Total social cost of driving is partly met by those using cars, but a substantial share remains as costs imposed on society (Oberholzer-Gee & Weck-Hannemann, 2002). Although the exact numbers of these negative externalities are difficult to estimate, they are certainly large (Van Dender, 2019). Generally classifiable in three broad categories – environmental (e.g., global and local air pollution), social (e.g., accidents and health related costs) and economic (e.g., infrastructure, congestion) – they can differ in their temporal and spatial scope. Some external costs, for example, congestion during rush hour in a city, occur immediately at the place of driving; others are far more complex and not as easily traceable to its specific origin (e.g., climate change).

Charging road users their marginal external cost, is a widely accepted principle in transportation literature (Button & Verhoef, 1998). The most optimal way to address external costs however, remains a topic of debate. Duncan and Graham (2013), highlight four canons of taxation for judging taxes: adequacy, equity, simplicity and efficiency.

In most countries, this translates to taxation structures traditionally focused on directly influencing prices for driving either through fuel taxes or vehicle taxes (Van Dender, 2019). Motor fuel taxes usually represent the biggest pillar due to one key advantage over other taxation forms, they operate on the user-pays principle. The amount paid increases proportionally to the consumption of the services provided, in this case, driving (Duncan & Graham, 2013). The result is a taxation structure which is extremely easy to administer and comply with.

However, relying on fuel taxation as the cornerstone of addressing driving related external costs, other than those related to carbon emission, does not fare particularly well in the canons adequacy, equity and efficiency.

Van Dender (2019) points out that fuel taxes, while effective for carbon-dioxide emissions, are not well suited to address other external costs. A number of studies find the tax rate on fuel to be drastically lower than what would be necessary to adequately meet external costs associated with driving. Parry and Small (2005) find

the optimal tax rate on petrol higher by about twice its 2005 size in the USA, and by around half in the UK, a claim also supported by Bjertnæs (2017) with more recent data. In Sweden, external costs are more than covered by fuel tax revenue in non-urban areas, but severely undercut in densely populated urban areas (Transport Analysis, 2015).

Increasing fuel taxes – besides being a highly unpopular measure (see Nisbet & Myers, 2007; Oberholzer-Gee & Weck-Hannemann, 2002) – does not hold the solution to the issues of addressing external costs of driving. For one, fuel taxation poses challenges to equity due to the spatial and temporal dimension of negative externalities. Driving in highly populated urban areas is both a cause and an intensifier of external costs (e.g., local pollution and congestion), and may result in a seven to nine times higher external cost in cities than in rural areas (Hennlock, 2020; Van Dender, 2019). Increasing the tax rates would exacerbate the uneven distribution of the tax burden between urban and rural areas.

Second, increasing fuel taxes does not solve the fundamental threat to adequate revenue generation. As vehicles become more fuel efficient, the transportation funding gap increases (Parry, Walls, & Harrington, 2007). Grigolon, Reynaert, and Verboven (2018) find that fuel taxes are a good instrument to incentivize high mileage consumers to purchase fuel efficient cars, which is desirable from a climate policy perspective, but sub-optimal for externalities dependent on vehicle mileage traveled, such as road-wear (Van Dender, 2019).

The ideal solution would include fiscal instruments targeting each externality's source, tailored to meet the idiosyncratic situation in any given country (Van Dender, 2019). Alternative policies include fuel-economy standards, charging for accident risks, removing free parking, (congestion) tolls and various forms of road pricing (see Parry et al., 2007; Van Dender, 2019).

Recent advances in technology make a special form of road pricing not only available, but highly attractive to policy makers (Langer, Maheshri, & Winston, 2017). Unlike city bound toll cordons or turnpikes on specific inter-city roads, vehicle mileage taxation (VMT) makes it possible to administer distance-based road and congestion pricing nationwide. Global positioning systems (GPS) provide an easy, highly accurate and flexible way of administering distance based road pricing in form of a VMT that differentiates not only on vehicle type, but also location (Tsekeris & Voß, 2009; Van Dender, 2019) and although other less refined options are available to mitigate short-term oriented privacy concerns (Duncan & Graham, 2013).

Vehicle mileage taxation is of course far from being perfect. Next to concerns over individual data privacy, critics argue taxing vehicle mileage is regressive, meaning low-income drivers pay a higher share of their income compared to wealthy drivers (Duncan & Graham, 2013). Whether these concerns are justified remains unclear. Comparisons between fuel tax and VMT regressivity remain inconclusive; some point to fuel tax as being modestly more regressive (Starr McMullen, Zhang, & Nakahara, 2010; Zhang, McMullen, Valluri, & Nakahara, 2009), others find the opposite (Weatherford, 2011). Sterner (2012) conclude for Europe that the tax is most likely approximately proportional.

Nonetheless, this tax scheme combines the advantage of a stable and future proof revenue stream (Langer et al., 2017); improved properties on adequacy, efficiency, equity, and visibility (Duncan & Graham, 2013); and, by combining it with fuel taxation, a holistic measure for most driving related externalities (Van Dender,

2019).

In summary, Parry et al. (2007) state the rationale for increasing fuel taxes has come and gone, being replaced by electronic road pricing as the "only real hope of addressing relentlessly increasing urban gridlock ...[and] improve highway safety more effectively" (p.21).

2.2 Previous Research on Road Pricing Acceptability

2.2.1 Acceptance of Policy

> It has been a commonplace event for transportation economists to put the conventional diagram on the board, note the self-evident optimality of pricing solutions, and then sit down waiting for the world to adopt this obviously correct solution. Well, we have been waiting for seventy years now, and it's worth asking what are the facets of the problem that we have been missing. Why is the world reluctant to do the obvious? (p.465)

Fifteen years after Lave's (1995) comment, his question remains relevant. Despite the benefits of road pricing and economist widespread support, road pricing, especially in the comprehensive form of a vehicle mileage tax, remains rare (Duncan & Graham, 2013). Oberholzer-Gee and Weck-Hannemann (2002) note that the difficulties which limit the introduction of appropriate pricing mechanisms are not technical in nature, but political; "... road pricing is rarely adopted because the public does not support these policy measures" (p.358).

At this point it becomes necessary to define acceptance and distinguish it from support, although the two are often used interchangeably by authors (Dreyer & Walker, 2013; e.g., Oberholzer-Gee & Weck-Hannemann, 2002). The discussion will then resume with a general overview of road pricing acceptance before narrowing down to exemplary implementations in Sweden.

Definition of Acceptability, Acceptance, and Support

Schade (2005) points out that various different disciplines deal with the concept of acceptance in equally various and manifold theoretical approaches and definitions, making an exhaustive synthesis impossible. Schade and Schlag (2003) remark that a range of studies have been published on the matter despite a lack of conceptual clarity, which they attempt provide with this definition:

> The term *acceptability* describes the prospective judgment of measures to be introduced in the future. Thus the target group will not have experienced any of these measures, making "acceptability" an attitude construct. *Acceptance* defines respondents attitudes including their behavioral reactions after the introduction of a measure (p. 47).

Acceptance and acceptability therefore still represent closely related constructs, differentiated mostly by timing. Research, such as this thesis, concerned with the

(potential) introduction of a policy thus intends to measure acceptability but may still ask respondents whether or not they *accept* the policy in question.

On the other hand, asking whether or not respondents *support* a policy, resembles a distinct construct and should not be conflated with acceptance (Dreyer, Teisl, & McCoy, 2015). Dreyer and Walker (2013) argue that the two constructs differ on two dimensions, an attitudinal–behavioral dimension and a temporal dimension, where acceptability is a precondition of support, but does not necessarily always lead to support. Support, on the other hand, may not be necessary for acceptance of a policy.

This becomes clearer when considering the attitudinal-behavioral dimension together with an example of introducing road pricing via vehicle mileage tax.

Before implementation, an individual may have a positive attitude towards a vehicle mileage tax. If politicians decide to pass such legislation, the individual would accept the reform; this corresponds to the reforms acceptability. Perhaps the individual is very convinced of the benefits of such a reform and decides to become active (i.e., show behavior) in its implementation process by calling their representative or promoting the reform in their social circle, thus supporting the policy. Depending on the country's political system, the individual may be able to actively vote for such a policy during an election, which would again be a form of support. Assuming the policy is implemented, a different, previously uninvested person may find they do not like road pricing, i.e., they have a negative attitude towards it. In the first step, they therefore do not accept the policy. Next, they may even become politically active in support of repealing the reform. This in turn may prompt the first to continue their supportive behavior in favor of the policy, now directed at continuing its existence.

In short, supporting a policy is more active than passively accepting it.

The conceptual differences between supporting and accepting, result in some implications for policy makers and researchers.

First, according to Dreyer et al. (2015), policy makers should carefully tailor their policy campaign strategies to maximize acceptance or support. Acceptance might benefit more from emphasizing effectiveness, while fairness aspects become more relevant for support.

Second, according to Huber, Wicki, and Bernauer (2019), idiosyncrasies of a country's political system should be taken into consideration, especially by researchers. Some countries like Switzerland may require higher levels of policy support since citizens are asked to actively vote on individual issues. Others, like Sweden, require citizens' acceptance since their voters generally vote in favor of a party based on a larger platform of policies, instead of singular issues. Referenda on specific issues are by contrast much less common. In general elections, other issues are more salient than road pricing measures (Oberholzer-Gee & Weck-Hannemann, 2002). Country specific findings therefore need careful consideration in regards to their generalizability.

General Findings About Road Pricing Policy Favorability

Oberholzer-Gee and Weck-Hannemann (2002) examine the introduction of road pricing schemes from a political economy framework, in which adopted policy measures are seen as the outcome of exchange processes between elected officials, voters and interest groups.

In their view, negative externalities of private transport can be seen as transfers to specific groups as they do not bear their full costs. Introducing policy, such as road pricing, redirects these transfers. Making such changes feasible depends not only on changes in welfare, but also on the influence of the involved groups.

Research into all groups involved in the present debate, and their respective influence, would be vastly beyond the scope of this paper; an overview of different groups' opposition reasons can be found in Frey (2003). Here, the focus is on the public's opposition. The public is, in itself, a heterogeneous group. Regular voters, for example, are not a random sub-sample and neither are road users. A positive correlation between winners of road pricing policy and voters is expected to exist mediated by high-income (Oberholzer-Gee & Weck-Hannemann, 2002).

Creating a coalition with high-income road users alas, is not as straightforward as one could expect; a substantial gap between academic and public reasoning for road pricing needs to be bridged.

Frey (2003) gives four reasons for public opposition of pricing mechanisms in transportation contexts: misunderstanding, general pricing aversion, government intervention and tax aversion, and distributional concerns.

Kallbekken, Kroll, and Cherry (2011) provide evidence that understanding of Pigouvian instruments, such as road pricing, does not influence the opposition to such measures. The other three reasons proposed by Frey (2003), however, have common underlying factors and are well supported in literature.

While economists put forward pricing mechanisms as an efficient method of allocating resources, individuals tend to favor other ways of allocating access, including lotteries and queuing (Kahneman, Knetsch, & Thaler, 1986). Willingness-to-wait is viewed as an especially fair allocation mechanisms, perhaps because of individuals' equal endowment with time (Oberholzer-Gee & Weck-Hannemann, 2002).

Distributional concerns caused by the implementation of a pricing mechanism, may be remedied to some extent by earmarking revenues for specific causes (Carattini, Baranzini, Thalmann, Varone, & Vöhringer, 2017). Different authors propose different revenue-destinations as most likely to increase the acceptability of road pricing. Oberholzer-Gee and Weck-Hannemann (2002) for one, recommend directing revenue generated by reducing road accessibility into infrastructure i.e., road network improvements. Others – such as Grisolía, López, and Ortúzar (2015) in Las Palmas de Gran Canaria, Spain – find acceptability of congestion charges increases when revenues are earmarked for environmental causes. Some agreement exists that lump-sum redistribution, or general unspecific lowering of other taxes, is the least favored version of redistributing generated revenue (Maestre-Andrés, Drews, & van den Bergh, 2019).

These findings point to fairness playing an important role in accepting road pricing. The perceived fairness of road pricing instruments has been largely acknowledged as one key determinant of acceptability and subsequent acceptance (Kim, Schmöcker, Fujii, & Noland, 2013)

The next key determinant, infringement of freedom, is closely tied to the public's aversion to taxes.

While tax instruments already face an uphill battle in winning the public's favor, the quest becomes additionally difficult if the instrument carries the label tax (Kallbekken et al., 2011). A potential reason could be that "[t]axes limit an individual's freedom to make autonomous decisions about his or her income" (Kirchler, 1999,

p.133). This is consistent with findings supporting the "Mill Hypothesis" that people prefer indirect over direct taxes, even if the tax burden is the same (Sausgruber & Tyran, 2005). Additionally, road pricing might be seen as particularly infringing on freedom due to a) high salience of the unattractive individual consequences of the measure (e.g., having to pay or not being able to use a road), while the long run benefits are considerably less salient (Oberholzer-Gee & Weck-Hannemann, 2002), and b) many other transportation policy measures are aimed at increasing choices for individuals (Kim et al., 2013). On the other hand, taxes are not purely intended as revenue generators, but moreover intent to steer public behavior. While less salient taxes might be more palatable to the public, lower responses from drivers would lower net benefits (Finkelstein, 2009).

Swedish Cases of Road Pricing Introductions

Local political, ideological and institutional context need to be recognized if the implementation of road pricing measures is to be successful (Attard & Enoch, 2011; Hysing & Isaksson, 2015). Sweden has attempted to introduce local road pricing measures, specifically cordon based congestion charges, in Stockholm and Gothenburg. The mixed results have sparked considerable transportation policy research.

Stockholm blazed the trail, introducing a congestion charge as part of a larger policy package in 2006 (Kottenhoff & Brundell Freij, 2009). Citizens were able to get familiar with the congestion charge during a trial period, and later supported the permanent introduction of the measure in a referendum (Hysing & Isaksson, 2015). The high acceptance of the measure has been explained with simultaneous improvements to public transport, general public awareness of the congestion problem, and lastly, a broad political alliance in favor of the congestion charge (Hysing & Isaksson, 2015).

The measure was not only accepted by the public, it was also effective in reducing congestion in the targeted area by around 20 % (Börjesson, Eliasson, Hugosson, & Brundell-Freij, 2012). With time, acceptance has increased even more (Eliasson, 2014). Inspired by the Stockholm case, Gothenburg – after striking a deal with the national government for co-funding a large infrastructure package – implemented a congestion charge too (Börjesson & Kristoffersson, 2015). Like Stockholm, Gothenburg held a referendum, and despite the congestion charge being effective (it reduced congestion by 10% one year after implementation (Hansla, Hysing, Nilsson, & Martinsson, 2017)), the citizens of Gothenburg surprisingly narrowly rejected the charge, which has not been followed by city officials repealing the measure. Hansla et al. (2017) conclude that procedural aspects played a larger role in the rejection than specific effects of the charge.

The city's difficulties in implementing a road pricing measure appear especially bizarre considering that Jakobsson et al. introduced a theoretical framework of road pricing acceptability based on a study conducted in Gothenburg in 2000. Their model explains the interactions of income, car usage, policy intention, perception of fairness and infringement on personal freedom, and policy acceptance (Figure 2.1). They show that a perceived infringement of personal freedom negatively affects policy acceptance, while that policies perceived as fair gain more acceptance. Other determinants of policy acceptance and acceptability include problem awareness, perceived effectiveness of the measure, as well as general and specific trust in government (Kim et al., 2013). Having said that, this thesis builds on the model proposed by

Jakobsson et al. (2000); specifically, infringement of freedom and fairness as mediating constructs on the acceptability of road pricing. These constructs are discussed in more depth in the following sections.

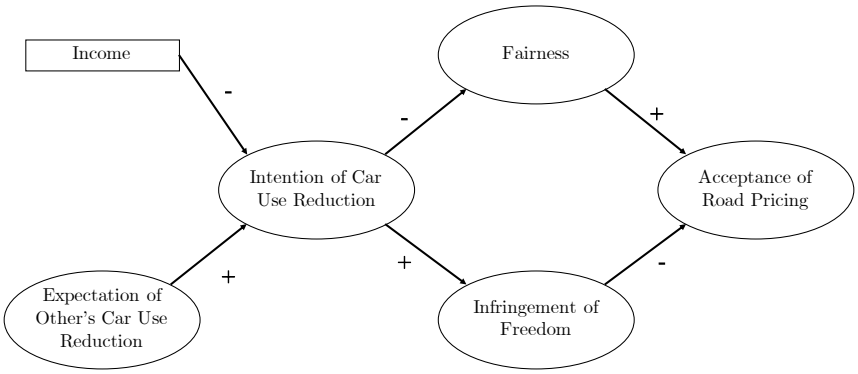


Figure 2.1: Determinants of Road Pricing Acceptability, Jakobsson et al. Model (2000)

2.3 Theoretical Approach

2.3.1 Fairness

The previous section has already indicated that it is rather difficult to define fairness universally. The evaluation of fairness differs between individuals and also, context-dependent within individuals (Johansson-Stenman & Konow, 2009).

The example of a congestion charge is well suited to illustrate different aspects individuals consider when evaluating policy fairness. First, perceived fairness appears to rely on outcome. The question of who is allowed to use a road, i.e., how the scarce resource "road" is distributed among individuals. People appear to evaluate this based on a measure of individual willingness-to-exchange-another-resource. Distributive justice, based on Adams's (1965) equity theory, is one of the oldest and best supported fairness theories.

In the previous section, findings by Kahneman et al. (1986) show that the input basis individuals favor in exchanging one resource, such as road space, for another need not necessarily be monetary. Willingness-to-wait was considered as much fairer decision basis in a number of their studies. This points to another, more recent theory fairness perception. The process of arriving at an outcome takes the center stage in procedural justice as proposed by Leventhal (1980).

The different conceptualizations' theoretical background, relevance for road pricing in general and vehicle mileage taxation in particular need closer discussion.

Distributive Fairness

Distributive fairness, often referred to as distributive justice, can be achieved using different social norms as guideline, including equality (equal distribution of outcome regardless of inputs), need (those in greatest need should receive the outcomes), power, and responsibility (R. Forsyth, 2006). While they play an important part in considerations of road pricing's proportionality, the social norm of equity is more important when considering the public's distributive fairness perception.

Equity theory as proposed by (Adams, 1965) states that perceived fairness, is the subjective result of a comparison process, in which individuals evaluate the outcome of an exchange process in relation to the exchange inputs. The outcome can be in relation to themselves or others, and can be positive as well as negative in nature. What exactly is viewed as a relevant input for the exchange is dependent on the subjective evaluation of the individual and does not necessarily require explicit awareness. Leventhal summarizes the theory as, "human beings believe that rewards and punishments should be distributed in accordance with recipients' inputs or contributions" (1980, p.28).

For road pricing in general, this is relevant because individuals do not prefer pricing as an allocation mechanism as outlined above. For the introduction of a comprehensive vehicle mileage tax, this fairness evaluation is relevant because the tax scheme attempts to redirect external costs of road usage under the user-pays principle. Here, the outcome, i.e., how much a road user pays in tax, depends on their input, in other words, how much negative cost they cause based on their driving distance, location and time. It is, as previously mentioned, questionable how salient this exchange is to road users.

Procedural Fairness

Distributive justice and equity theory have further been heavily criticized by Leventhal (1980) because of its narrow scope on outcome:

> The distribution of reward or punishment is only the final step in a sequence of events. However, equity theory and the concept of distributive fairness restrict the analysis of perceived justice to this last step in the allocation process. Perceived fairness is defined solely in terms of the distribution of reward. The social system which generates that distribution is not considered. (p.35)

Alternatively, he introduced procedural justice as key in understanding fairness perception. Here, fairness is judged based on six rules for the allocation process: 1. Consistency, 2. Bias-Suppression, 3. Accuracy, 4. Correctability, 5. Representativeness, and 6. Ethicality.

For road pricing, this means, on one hand that the mechanism itself ought to adhere to these rules; on the other hand, the process of implementing a road pricing policy needs to conform to these rules as well. The latter has been by far the focus of researchers for environmental policies in general (e.g., Beuermann & Santarius, 2006; Maestre-Andrés et al., 2019), for road pricing (e.g., Hansla et al., 2017; Hysing & Isaksson, 2015), and finally for vehicle mileage taxation in particular (e.g., Duncan & Graham, 2013; Krishen, Raschke, & Mejza, 2010)

Perceived Fairness

Transportation and Environmental Policy research has rather seldom differentiated between the two fairness theories, often relying on a combined, single item measure of overall perceived fairness (e.g., Jakobsson et al., 2000; Krishen et al., 2010). This is on so far justified, as studies into the acceptability or implementation support of a policy are concerned with future events. Instruments aimed at measuring distributive and procedural justice may prove challenging for individuals to respond to as

the target of fairness-consideration usually lies in the past (Colquitt & Rodell, 2015), which is not meant to imply that a differentiated understanding of the two concepts, as they apply to policy, is not valuable or feasible, as Hysing and Isaksson (2015) with their assessment of procedural fairness limitations in the implementation of Gothenburg's congestion charge demonstrate.

2.3.2 Psychological Reactance Theory

The other main mediator in Jakobsson et al.'s (2000) cross-culturally supported (Fujii, Gärling, Jakobsson, & Jou, 2004) model of road pricing acceptance is infringement of freedom. In the context of transport policy, this construct has received attention from other researchers, such as Schade (2005), and is expected to play a crucial role in introducing vehicle mileage taxes (Duncan & Graham, 2013).

Being one of many determinants of policy acceptability, infringement of freedom is easy to underestimate. The construct becomes increasingly relevant and important when viewed from a psychological perspective(S. S. Brehm & Brehm, 1981). In psychology, infringement of freedom is seen not as an end result of a process, but as the ignition of a specific motivational state called reactance.

Much like in physics where applying a force causes an equal but opposite force in the direction of the first, humans can react to messages which they perceive to threaten their individual freedom with motivation to reestablish that freedom.

The next sections first introduce psychological reactance theory (PRT), before relating it to the introduction of a vehicle mileage tax.

Definition, Causes, and Effects of Psychological Reactance

Reactance was first introduced by J. W. Brehm in 1966 and has since then sparked immense amount of research both in theoretical advancement of the concept and application to a variety of topics such as health, marketing, and policy (Rosenberg & Siegel, 2018).

In its beginning, reactance was defined as,

> ... the motivational state that is hypothesized to occur when a freedom is eliminated or threatened with elimination ... a counterforce motivating the person to reassert or restore the threatened or eliminated freedom. It exists only in the context of other forces motivating the person to give up the freedom and comply with the threat or elimination (S. S. Brehm & Brehm, 1981, p.37).

From this it follows that reactance requires four main components: *Freedoms* are not only perceived to exist in regard to past, current or future behavior, individuals are further aware and capable of engaging in these behaviors (J. W. Brehm, 1966; S. S. Brehm & Brehm, 1981). Next, these *freedoms are threatened or eliminated*, meaning individuals cannot exercise their freedoms in the way they expect to. How strong the *arousal of reactance* is, is therefore dependent on two key aspects, the characteristics of the freedom and those of the threat. The higher extent and importance of a given freedom are to an individual, the higher the motivation to restore it (S. S. Brehm & Brehm, 1981). The higher the severity of the threat, the higher the state of arousal (J. W. Brehm, 1966).

This arousal is an averse experience, prompting individuals to reduce it by *restoring the freedom*, which can be attempted by using different reduction strategies; these include reevaluation of the freedoms, increased efforts in attaining the restricted freedom and targeting the source of the freedom restriction (Rosenberg & Siegel, 2018).

Measuring State Reactance

Initially, reactance was proposed as a purely hypothetical construct, making it impossible to directly measure it and relying on observation of behavioral changes to interpolate the existence and magnitude of reactance arousal (S. S. Brehm & Brehm, 1981).

After criticizing the shortcomings of an unoperationizable theoretical construct, Dillard and Shen (2005) developed a self-reporting measure of reactance. They additionally advanced the theory of psychological reactance by proposing an intertwined model of reactance (Figure 2.2). An individual experiences the motivational arousal, with a combination of negative cognitive and emotional aspects. Negative thoughts and anger do not only co-occur but interact when reactance is present. This contribution spurred expansive application of reactance theory, primarily to communication research, and has been supported by a meta-study spanning many different contexts (Rains, 2013).

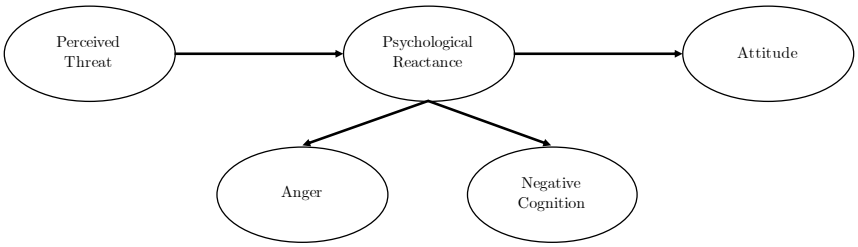


Figure 2.2: The Intertwined Model of Psychological Reactance by Dillard and Shen (2005)

Psychological Reactance and Road Pricing

The theory of psychological reactance brings a number of important implications for the acceptability of road pricing, which go beyond the simple conceptualization of infringement of freedom.

First, road pricing measures of any kind can be characterized as coercive, intending to limit an individual's mobility options rather than increasing their available choices without directly imposing their usage on the public (e.g., improving public transport) (Kim et al., 2013). Road pricing reduces the available mobility either by distance, location or time, thus restricting some to freely engage in a previously available behavior.

This *perceived* threat matters especially for the acceptability of road pricing measures before those measures are implemented (see Fujii et al., 2004; Jakobsson et al., 2000; Kim et al., 2013). The individual becomes motivated to reduce the averse arousal of reactance, which, in the case of road pricing, can include a number of strategies. On one hand, an individual might be motivated to prevent the measure from taking effect or otherwise evade the measure's effects. However, it is also

possible for an individual to lessen their arousal state by reorganizing their threat-related cognition in favor of the threat's source (S. S. Brehm & Brehm, 1981). This could, for example, be done by devaluing the importance of road access, or increasing the value of positive effects of road pricing measures. Some studies have shown that this is more likely to occur if an individual perceives a policy as inescapable (Schade & Baum, 2007), which further fits with findings of road pricing policy acceptance increasing after it's implementation in Stockholm (Schuitema, Steg, & Forward, 2010).

Psychological Reactance When Introducing a Vehicle Mileage Tax

For novel policies, such as a vehicle mileage tax, this implies that minimizing psychological reactance can be seen as an important objective for proponents; especially before and during the implementation process. Communication research overwhelmingly supports the idea that the word choice plays a central part in influencing the strength of a freedom threat inherent in a message (Rosenberg & Siegel, 2018). Controlling language includes words such as "must", "no choice" etc., is perceived as more threatening than autonomy-supportive language (e.g., "could", "possible") (Burgoon, Alvaro, Grandpere, & Voulodakis, 2002).

Tax aversion, mentioned briefly above, could, in part, be explained by the arousal of psychological reactance. Thus, a vehicle mileage tax, unlike other measures such as congestion charges or toll vignettes, could be perceived as especially infringing on personal freedom and therefore arouse high reactance. On the other hand, politicians might favor a vehicle mileage tax over increasing gasoline taxes because it is a new policy and thus comes with less baggage than existing policy (Langer et al., 2017).

2.3.3 Change

The novelty of a vehicle mileage tax may, on the other hand, also limit it's appeal to the public precisely because of it being new. The introduction of a vehicle mileage tax represents a considerable change to the way road usage has been managed so far. Humans, generally considered creatures of habit, respond differently to change. Some actively seek it out, embracing change, while others resist it and try to avoid it whenever possible (Oreg et al., 2008).

While some authors argue that changes to the overall mobility landscape could ease the transition to a vehicle mileage tax (Karpilow & Winston, 2016; Winston, 2017 in Langer et al., 2017), it has been well supported that people dislike change even if it is docile and its context beneficial (Oreg et al., 2008).

As Fernandez and Rodrik (1991) point out, reforms can be rejected, even though they would receive adequate political support if they were adopted. It seems people tend to favor what they know over what could be, even if the alternative would bring substantial improvements over the current situation.

Status Quo Bias

This contradiction to a staple of economic theory – namely that rational agents have stable preferences – has been explored extensively in the economic literature and by behavioral scientists as the status quo bias (Kahneman, Knetsch, & Thaler, 1991).

The name goes back to Samuelson and Zeckhauser (1988) who, in a series of experiments, showed that individuals prefer preserving the existing state over alternatives, even if these alternatives are objectively better.

Thus, although a politician might favor proposing a new policy instead of amending an existing one, the public might prefer keeping the current policy altogether.

Samuelson and Zeckhauser (1988) categorize explanations into three categories

> (1) rational decision making in the presence of transition costs and/or uncertainty; (2) cognitive misperceptions; and (3) psychological commitment stemming from misperceived sunk costs, regret avoidance, or a drive for consistency (p.33).

As previously laid out, the effects of a vehicle mileage tax are net-positive for society, making it the rational choice to change to this policy.

Status quo bias would therefore be explained by the other categories. Out of psychological commitment, most factors seem unlikely explanations because most members of the public have not made a conscious decision opting for the current way of addressing road usage cost, which would be required for drive for consistency and sunk costs. People may however want to avoid regret over making a choice that turns out to be wrong. Bearing bad consequences as the result of inaction is favored to experiencing bad outcomes after taking action (Kahneman & Tversky, 1982)

For the case of reforming road pricing, this implies people might favor continued congestion from keeping ill-fitting cost-internalization mechanisms, such as gasoline taxes, over introducing better suited measures such as time and location specific vehicle mileage taxes.

Regret avoidance is amplified by cognitive processes, such as loss aversion and the endowment effect, which deserve more in-depth reviewing.

Loss Aversion

Status quo bias can be partially explained by the disadvantages of leaving appearing greater, than the advantages (Kahneman et al., 1991). An asymmetric relationship between losses and gains leads to individuals requiring more compensation to give up something than they would be willing to pay for its acquisition (Kahneman et al., 1991). The result is an S-shaped value function steeper for losses than gains; Figure 2.3 shows an example. Loss aversion states that, relative to the reference point at the origin of the value function, a loss of one unit is more repelling than a one unit gain is appealing (Kahneman et al., 1986)

In the case of reforming a policy, this translates to individuals accepting a policy over the current policy only if they perceive the gains associated with the new policy as significantly larger than the losses of giving up the current, familiar policy. For the introduction of a vehicle mileage tax, this points to two potential issues. First, in addition to being in different dimensions (money and e.g., time) (Oberholzer-Gee & Weck-Hannemann, 2002), the gains to society of such an instrument (e.g., better internalization of cost and thus reduction of stress on the commons) are less salient to individuals than their individual losses from this internalization (e.g., having to pay for distance driven) (Duncan & Graham, 2013).

Second, differences between two policies will appear greater if they are both perceived as disadvantages, because the curve is steeper on the loss side. However,

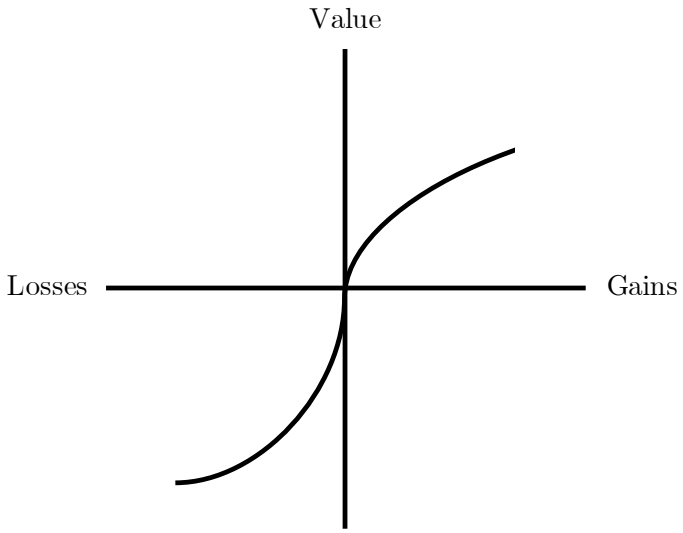


Figure 2.3: A Hypothetical Value Function According to Prospect Theory, Which is Steeper in the Loss Quadrant Than in the Gains Quadrant (Kahneman & Tversky, 1979)

policies are never proposed in a vacuum, always at least competing against the status quo as a reference point (Alesina & Passarelli, 2019).

Endowment Effect

The other cognitive misperception relevant to understanding status quo bias is the endowment effect, that is, a positive change in a good's value after it enters one's endowment (Thaler, 1980). Specifically, the pain of giving up the endowed good increases, not its actual appeal (Kahneman et al., 1991).

For road pricing of various kinds, and vehicle mileage taxation in particular, this is relevant as people "treat opportunity costs differently than "out-of-pocket" costs" (Kahneman et al., 1991, p. 203). Paying directly for various external costs of driving is a perceived loss and as such more painful than the forgone gain of enjoying opportunity costs of driving, such as uncongested roads or clean air.

2.3.4 Communicating Policy

It follows naturally that if a politician hopes to introduce a road policy reform such as a vehicle mileage tax, special attention needs to be paid to the communication of said plan. The topic of policy communication is vast, complex and diverse; well beyond the scope of this thesis.

Specific communication aspects however play an integral part of the theories discussed so far. For one, arousal of psychological reactance has been well established to depend on the features of a message (Rains, 2013). Among those features are forcefulness of language persuasion intent and framing (Shen, 2015).

Framing is furthermore a core concept of prospect theory which underpins the status quo bias, loss aversion, and the endowment effect (Kahneman & Tversky, 1984).

Framing

Rein and Schön (1993) define framing as,

> a way of selecting, organizing, interpreting, and making sense of a complex reality to provide guideposts for knowing, analyzing, persuading, and acting. A frame is a perspective from which an amorphous, ill-defined, problematic situation can be made sense of and acted on (p.146).

From this definition follows that all policy, and indeed all communication, happens through frames (see van Hulst & Yanow, 2016, for an overview of frames and framing in politics). Making sense of problematic situations via frames, however, does not guarantee that one arrives at an inevitable, objective conclusion. In fact, framing may achieve the opposite, leading people from the same information to vastly different conclusions. Via semantic restructuring, "[t]he same option, however, can be framed or described in different ways" (Kahneman & Tversky, 1984, p. 343).

For example, Kallbekken et al. (2011) show that labeling a Pigouvian road pricing instrument as a tax instead of a fee can significantly decrease support for the instrument.

These types of frames where the same critical information is presented either positively or negatively, are broadly called valence frames and can be further distinguished into three categories (Levin, Schneider, & Gaeth, 1998).

The most simple kind of valence framing is labeled attribute framing, in which a certain aspect of an object or situation serves as the focus of framing manipulation (Levin et al., 1998). The most classical type of framing is identified by them as risky choice framing. Here, outcomes are attached to different levels of risk. Lastly, they mention goal framing, where an action or behavior has the goal to either achieve or avoid a certain outcome.

Framing has been employed by a number of researchers investigating acceptability of various road pricing instruments. Huber et al. (2019) frame their choice experiment of different transport policy instruments through gain (promote electrical vehicles) and loss (reduce vehicle emission) goal frames, but find no differences in perceptions of fairness, effectiveness, intrusiveness or support.

Krishen et al. (2010) use gain (obtain improvements to infrastructure) and loss (avoid restrictions to infrastructure) goal frames to propose the introduction of a vehicle mileage tax in Nevada, USA. They find these frames to have a strong effect if read by individuals with a matching regulatory focus.

Leaving isolated single manipulation studies behind, Eliasson (2014) argues in an examination of Stockholm's congestion charge that framing of road pricing instruments changes over time, especially after they are implemented.

The reviewed literature narrows the research questions down into a combination of parameters which are expected to influence the acceptability of vehicle mileage taxation. They allow for a number of hypotheses to be formulated, some broad and others narrow, which can be tested in order to provide answers to the research questions.

2.3.5 Hypotheses About VMT General Acceptability

Drawing on the model of road pricing acceptability by Jakobsson et al. (2000, Figure 2.1) and the other research on road pricing reviewed, two main mediators are expected to influence the acceptability of a vehicle mileage tax. The first is the perceived fairness of the vehicle mileage tax.

The other model component, infringement of freedom, is augmented by the more refined theory of psychological reactance.

Thus, the first two hypotheses are introduced as:

> H_1: The acceptability of a vehicle mileage tax in Sweden is higher, the fairer the policy is perceived to be.
>
> H_2: The less psychological reactance is aroused by the vehicle mileage tax, the higher its acceptability.

Under the intertwined model of psychological reactance, an amalgamation of anger and negative cognition will be present when an individual experiences reactance. Shen (2015) state that it is good practice to always test model assumptions of psychological reactance. Therefore, two additional hypotheses are introduced for H_2:

> H_{2a}: Threat to freedom positively predicts anger.
>
> H_{2b}: Threat to freedom positively predicts negative cognition.

Thus, the model for vehicle mileage tax acceptability proposed by this study is presented in Figure 2.4.

The corresponding hypothesis states that:

> H_3: The proposed model structure fits the empirical data.

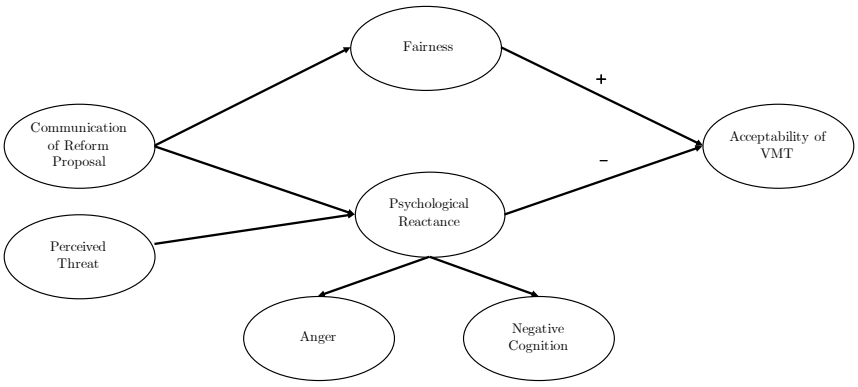


Figure 2.4: The Proposed Model for Vehicle Mileage Tax Acceptability

2.3.6 Hypotheses About VMT Framing

Next, it is expected from the reviewed literature that the context in which the vehicle mileage tax is presented has an influence on its acceptability.

Previous research suggests that a policy reform is not implemented before the year 2030, thus initially subsidizing electric vehicles and fuel efficient cars reducing carbon emissions in the transport sector (Hennlock, 2020).

This provides the first opportunity for framing of the policy proposal. One frame, which highlights stability, and another, which emphasizes change. The stability frame consists of a focus on keeping current policy until 2030, while the change frame stresses the introduction of a new policy in 2030. It is expected that people will favor the stability frame due to the discussed general aversion to change.

The second framing opportunity stems from the fact that currently flat gasoline taxes are levied on all diesel and petrol vehicles, which does not correspond to the different social marginal cost levels. This indifference results in subsidizing driving in urban areas, as well as electric driving. Under the stability frame this results in two equally true proposals of a) keeping subsidies and b) keeping taxes until introducing vehicle mileage taxation in 2030. In parallel, for the change frame this results in a) reducing subsidies and b) increasing taxes for driving in 2030 by introducing vehicle mileage taxation. The framing via taxes and subsidies, while describing the same outcome, conveys different implications.

The perceived outcome for each frame as they would be expected from prospect theory are given in Table 2.1.

Table 2.1: Frames and Expectation of Perceived Outcome

Frame	**Stability**	**Change**
Subsidy	Gain	Gain Reduction
Tax	Loss	Loss Increase

These framing differences are expected to influence the model parameters, and thus the acceptability of the proposed vehicle mileage tax.

Framing Effects on Perceived Fairness

Kahneman et al. (1991) explain that gains will be perceived as more fair than losses. They extend this intuition by comparing the same outcome from a frame of gain reduction and a loss frame. According to them, prospect theory predicts, in this case, that the loss (e.g., a surcharge) is judged as more unfair than an equal gain reduction (e.g., eliminating a discount).

> H_4: Under the stability condition, taxes are considered more unfair than subsidies.
>
> H_5: Increasing taxes (which is likely to be judged a loss) is considered more unfair than reducing subsidies (a reduction of a gain).

Framing Effects on Reactance

Again, beginning with the change versus stability frame, Kayser, Graupmann, Fryer, and Frey (2016) show that reactance to change can arise from the experience of lacking choice or moving away from the known. Thus it is expected that:

> H_6: Under the stability frame, reactance arousal is lower than under the change frame.

Furthermore, the outcome of change is expected to play a role. Shen (2015) argues that loss-frames and message threat overlap in their highlighting of negative consequences. Further, they explain that despite being conceptually different, the frames are empirically closely related. They find this effect to hold in their study of health communication. This lead to the seventh hypothesis:

> H_7: Labeling policy as taxation increases reactance compared to labeling it as subsidies.

Again, following the reasoning of Kahneman et al. (1991) and combining the expected effects of the two frames on reactance, an interaction effect of the two frames is expected to emerge.

> H_8: The gain stability frame shows the lowest reactance, the loss-increase frame the highest.

Framing Effects on Acceptability

Thus, under the Jakobsson et al.'s model of road acceptance (2000), the effects of the framing should emerge parallel to the structure above:

> H_9: The taxation frame acceptability is lower than the acceptability of the subsidy frame.
>
> H_{10}: The change frame acceptability is lower than the acceptability of the stability frame.
>
> H_{11}: Increasing taxes has the lowest acceptability, keeping subsidies has the highest acceptability.

The expected framing effects are summarized in Table 2.1.

Table 2.2: Expected Framing Effects

Frame	Stability	Change
Subsidy	++ fairness, −− reactance, ++ acceptability	+ fairness, − reactance, + acceptability
Tax	− fairness, + reactance, − acceptability	−− fairness, ++ reactance, −− acceptability

2.3.7 Hypotheses About VMT Policy Characteristics

This study further attempts to provide guidance in the design of a vehicle mileage tax. Perceptions of fairness, the extent to which the policy threatens freedoms and ultimately, the acceptability of the instrument is likely to depend on specific characteristics of the tax and characteristics of road users (Langer et al., 2017). These include foremost the height of the tax level, as this determines winners and losers of the tax change (Lave, 1994; Tsekeris & Voß, 2009; Vanoutrive & Zijlstra, 2018). It follows that lower levels reduce the amount of people priced out of using roads. Thus:

H_{12}: The acceptability of the vehicle mileage tax is expected to increase with lower tax rates per kilometer.

The big potential of a differentiated vehicle mileage tax lies in distributing the tax burden more equitable. This implies rural areas to experience tax relief, while urban drivers are met with a tax increase. Langer et al. (2017) speculate that in the USA, all else equal individuals in rural areas may be more price sensitive than drivers living in urban areas. A differentiated vehicle mileage tax would generally relief tax burden in rural areas.

The final hypothesis therefore expects that:

H_{13}: Individuals living in rural areas are more willing to accept a vehicle mileage tax than people living in urban areas.

Chapter 3

Data

To answer the research questions and to meet the aim of informing Swedish policy makers, data about the acceptability of a vehicle mileage tax in Sweden is required. Additionally, this type of data is ideal, as Sweden has a prominent history in transportation policy research (Huber et al., 2019).

While in theory the population is all eligible voters in Sweden, since their attitude towards road pricing measures is relevant to politicians, it is arguably even more important to capture the attitude of road users, as they compromise the group most likely to resent the implementation of such policy and are further especially vocal and well organized on road usage related matters (Oberholzer-Gee & Weck-Hannemann, 2002).

Thus, a representative sample of the Swedish population was commissioned from a market research company Enkätfabriken. Data was collected from equal sizes of people living in major cities (Stockholm, Gothenburg, Malmö) and in rural areas, with the goal of closely reflecting gender and age distributions of the two target areas. The survey used web panels by CINT, from which this study recruited people aged 18 years or older throughout all of Sweden. All panelists in the web panel receive compensation in points form, which can be paid out or donated to charitable purposes in monetary form.

The sample of this study aimed for 200 participants in each area. Responses were collected between 30 April 2020 and 04 May 2020, for a final sample size of 407 complete responses (203 from metropolitan and 204 from rural areas). The mean age in the sample was 47.59 years (48.26 years in urban areas, 46.83 years in rural areas). 68% of the overall sample stated they owned or had regular access to a car (54% in urban and 81% in rural areas). Genders were equally distributed across the sample. Appendix A.1 includes additional distribution graphs for background statistics such as income and attitudes to different topics.

Chapter 4

Methods

Two separate experimental methods were used, embedded in one online survey. Using survey experiments has enjoyed great popularity in policy studies and allows for causal conclusions by varying certain aspects of a survey across respondent groups (Hainmueller, Hopkins, & Yamamoto, 2014).

Here, the sample was assigned randomly to the four conditions of the 2x2 factorial design, resulting from the framing approach. Descriptive data for age, car ownership and living area for each treatment group were similar and can be found in Table 5.2.

Construction of the survey, instruments therein and model specifications are described in the next sections.

4.1 Survey Design

The survey experiment consisted of four parts and was structured after the design employed by Huber et al. (2019):

1. Information about policy background
2. Framing Experiment
3. Choice Experiment
4. Socio-demographic and other background survey

Incorporating a framing and choice experiment requires careful consideration of potential effects. The most straightforward approach to incorporating framing is by implementing it in the attribute descriptions, e.g., varying the label between mileage fee and mileage tax (see Kallbekken et al., 2011).

Embedding the entire choice experiment in different frames from a framing experiment poses the risk that effects in one experiment become confounded by the effects of the other (Huber et al., 2019).

On one hand, the decisions between different choice sets made in the choice experiment could lead to participant's evaluating a policy not based on its attributes, but on their choices (Rienstra, Rietveld, & Verhoef, 1999). According to Huber et al. (2019), this type of ad-hoc rationalization can be mitigated by first presenting rating scales for the overall perceptions of a policy, and later assessing specific characteristics of the policy (see also Hainmueller et al., 2014; Wallander, 2009). On the other hand, spillover effects from the framing experiment into the choice experiment

were not only accepted, but wanted. Therefore, the framing texts were repeated immediately before the choice experiment section.

Translation of Survey

After the survey design was completed, it was translated into Swedish. Critical passages, i.e., those where the exact word-meaning needed preservation, were discussed carefully. The finished translation was independently reviewed for consistency with the English version by two native Swedish speakers. The translated survey was sent to the survey company for online implementation.

The full survey design in English and Swedish can be found in Appendix B.1.

4.2 Information Presented in the Survey

Before engaging in the study, participants were informed about the intention, institutions involved and procedure of the survey. Replies were guaranteed to be anonymous and participants were thanked for their time and effort.

On the first page, participants were asked to carefully read a background information summarized from Trafikanalys' Annual Report 2018. The summary provided insights into the expected external costs per mileage of passenger vehicles in comparison to fuel taxes and associated issues in Sweden.

It included statements about the current taxation mechanism such as

> As a result, an average car pays more taxes than it causes social costs per kilometre in rural areas, while paying less taxes than caused costs per kilometre in large cities. Driving in cities is therefore subsidized

and

> Since they do not pay transport taxes, cars with electric driving pay less in taxes than the costs per kilometre that they cause to society. Driving for instance electric cars is therefore subsidized.

The full background text is included in the full questionnaire in Appendix B.1

4.3 Instruments

The instruments used by this study are presented in the way they appear in the survey.

First, the framing experiment is discussed and corresponding items and scales presented. Next, the choice experiment is discussed. After a brief explanation of the general approach, the design process and resulting choice experiment for this story are discussed. Last, information about the additional data gathered is presented.

A list of all variables, their corresponding (sub-)scales and levels can be found in Appendix C.3.

4.3.1 Framing Experiment

Literature and theory review resulted in a 2x2 factorial design, with one frame varying stability versus change and the second varying the label subsidy versus tax.

The information about the planned policy reform was semantically restructured to correspond with the outcome perceptions outlined in Table 2.1. Four messages were written with insights from theory in behavioral economics (e.g. Kahneman et al., 1991). All express the same consequences but in different ways. The first frame used positive language (subsidies) versus negative language (taxes). Secondly, the salience of impending change was varied by highlighting stability until 2030 versus emphasizing change in 2030. The resulting texts are presented in Table 4.1. One of the two options in square brackets was presented, depending on the treatment group.

Table 4.1: Comparison of Treatment Frames

Stability Frame	Change Frame
Proposal for keeping the [*subsidies / taxes*] until 2030: Keep current [*subsidies / taxes*] for petrol and diesel cars in large cities until 2030. Keep current [*subsidies / taxes*] for cars with electric driving until 2030.	**Proposal for [*decreasing the subsidies / increasing the taxes*] in 2030:** [*Reduce subsidies / Increase taxes*] for petrol and diesel cars in large cities in 2030. [*Reduce subsidies / Increase taxes*] for cars with electric driving in 2030.

Note: Bold text appeared as title of the policy proposal. Italics indicate changes corresponding to the positive / negative language framing.

Following each treatment, the same explanation of a mileage based scheme was added to the framed policy proposal:

> Afterwards, shift to a mileage tax, a tax paid per mile, where the mileage instead of the fuel is taxed. The level of the mileage tax is higher in large cities than in rural areas. In turn, fuel taxes are reduced. Cars with electric driving are subject to lower level charges per mile than petrol and diesel cars. The location of driving can be identified with a technology not storing personal information.

Directly after reading these texts, participants were asked to give their opinion about the policy and its presentation in regards to acceptability, fairness and experience of reactance.

Scales and Items

Unless otherwise noted, all items were recorded on verbally defined seven-point Likert items ranging from *strongly disagree* to *strongly agree*.

Acceptability was measured in two ways. General acceptability of the policy reform was measured using two items adopted from Jakobsson et al. (2000), alpha reliability was 0.92.

The first measured support (Do you support the vehicle mileage tax?), the second focused on the more passively conceptualized acceptability (Are you willing to accept the vehicle mileage tax?).

During the choice experiment later in the survey, participants were asked to choose between different policy scenarios with the prompt: "I am most willing to accept:".

Fairness was measured by asking "I find the vehicle mileage tax...", after Jakobsson et al. (2000, also Kim et al., 2013; Krishen et al., 2010). The answers were supposed to be recorded on a seven-point Likert item ranging from *very unfair* to *very fair*. A data collection error led to the omission of one response option *(Fair = 6)*.

Psychological Reactance was operationalized as the intertwined process model by Dillard and Shen (2005). In their original scale development, they however do not provide a scale for negative cognition. Instead they asked their respondents to list thoughts they had during the reading of the messages and later coded them into the categories positive, neutral and negative. For this study, it was slightly modified mirroring Liang, Kee, and Henderson's (2018) approach of using a four-item subscale for negative cognition.

This results in three sub-scales and ten items in total. The item order was randomized in the survey to prevent potential order effects.

Threat to Freedom ($\alpha = 0.83$) was assessed as an induction check with three items developed by Dillard and Shen (2005): 1. The message threatened my freedom to choose. 2. The message tried to make a decision for me. 3. The message tried to manipulate me..

Anger ($\alpha = 0.93$) was assessed similarly with three items: 1. This message made me angry. 2. This message irritated me. 3. This message made me annoyed..

Negative Cognition ($\alpha = 0.81$) was measured with four items taken from Liang et al. (2018): 1. I found myself looking for flaws in the way the information was presented in the message. 2. I couldn't help but to think about ways that the information being presented was inaccurate or misleading. 3. I found myself thinking of ways I disagreed with what was being presented. 4. I felt like I wanted to 'argue back' to what was going on in the message.

An overall reactance score ($\alpha = 0.91$) was created using the anger and negative cognition items (see Shen, 2010).

4.3.2 Choice Experiment

So far, participants only indicated their general attitude towards the introduction of a vehicle mileage tax. While this simplification is suited for the research question regarding policy communication, acceptability of a vehicle mileage tax is likely to depend on specific characteristics of the policy instrument. For instance, the methods used to administer a vehicle mileage tax (Kallbekken et al., 2011); whether

or not the tax is flat or dynamic (time and/or location dependent) (Langer et al., 2017); and finally the corresponding price levels (Lave, 1994).

Traditional experimental designs are limited in this regard because they allow for effect analysis of the manipulation as a whole, but not for individual components (Hainmueller et al., 2014). In other words, while it is possible to measure a tax increase's general perception, effects of the increase's magnitude elude the researcher.

Different research disciplines have attempted to find solutions to this, leading to conjoint analysis rapidly emerging in market research in the 1970s (Holmes, Adamowicz, & Carlsson, 2017). Due to its manifold application possibilities and potential advantages over other stated preference methods, this technique has enjoyed wide use in different fields from marketing research, sociology or political sciences (Hainmueller et al., 2014; Holmes et al., 2017; Wallander, 2009). Conjoint analysis was subsequently improved and simplified by predicting choices in marketplaces more directly on the basis of discrete choice theory, as formulated by McFadden (1974). The approach, in turn, was conceptually founded in random utility theory, which assumes that given available alternatives, the alternative providing the highest utility to the individual will be the preferred choice of that individual (Thurstone, 1927). This approach has become known under different names, including "choice experiments" and "choice-based conjoint analysis" (Holmes et al., 2017). The important denominator is that these methods "elicit a discrete response to an experimentally designed set of choice alternatives" (Holmes et al., 2017, p. 134). Choosing requires trade-offs between alternatives, which makes the experiment realistic (Carattini et al., 2017).

In short, choice experiments ask participants to make a choice between different alternatives that have certain attributes (e.g., level of fuel taxes) at different levels (e.g., 6 SEK / l versus 8 SEK / l). From a set of alternatives, , participants select the choice which they prefer most . By varying the attribute levels between different choice situations in a systematic way, it can be statistically inferred how participants trade-off between different attributes.

The following section explains the design of the choice experiment used in this study in more detail.

Implementing Choice Experiments

Holmes et al. (2017) state seven steps in implementing choice experiments:

1. Characterize the decision problem
2. Identify and describe the attributes
3. Develop an experimental design
4. Develop the questionnaire
5. Collect data
6. Estimate model
7. Interpret results for policy analysis or decision support

Most of these steps are required for any experimental design, however, especially step two and three require more elaboration for choice experiments.

Holmes et al.'s (2017) explanation of each step is summarized before being applied to the design of the choice experiment implemented in this study.

Characterizing the decision problem includes defining two key issues: 1. the geographic and temporal scope of the choice outcomes, and 2. the associated value types.

The first key issue relates to all experimental designs and follows from the specific research question. Here, the geographic scope was Sweden and the temporal scope extended to all individuals likely to be affected by the policy reform proposed to take effect in 2030.

The associated value type is more unique to choice experiments. Holmes et al. (2017) give two examples of value types; first, use value or behavior, this includes, for example recreation sites or market goods. The second value type, which applies to this study, is best represented as a public choice on a set of policy change attributes.

Attribute identification and description is one of the most challenging steps in designing choice experiments (Holmes et al., 2017).

For one, the number of attributes and attribute levels has a direct impact on sample size requirements. On the other hand, the quantity and quality of attributes directly relate to the possibility to elicit meaningful responses from participants. Too few attributes or attribute levels will misrepresent reality, too many or wrongly specified attributes and attribute levels can lead to confusion, introducing uncontrollable errors in the data.

Schultz, Johnston, Segerson, and Besedin (2012) give a number of standards for stated-preference studies, of which three are especially relevant to choice experiments (Holmes et al., 2017):

1. Measurability: Quantifiable endpoints
2. Interpretability: The target population can understand the attributes and corresponding levels
3. Comprehensiveness: All relevant endpoints are described

As previously discussed, a key attribute of vehicle mileage taxation is that it can be designed to vary depending on time and location, or even a combination. This results in an extensive amount of possible characteristic combinations. For example: flat, versus differentiated by time, versus differentiated by location; for all vehicles, only for electrical vehicles; compensation by reducing fuel tax, versus no compensation, and so on. Multiplying by different possible levels of taxation results in too many possible choice attributes to test in a single study.

The attributes of biggest interest to the research questions are differentiation based on location (urban versus rural) and vehicle type (fossil free versus fossil). Thus, the attributes and attribute levels were based by previous research presented in Table 4.2.

These levels enable evaluation of preferences regarding the overall acceptability of a vehicle mileage tax, compensation in form of reduced fuel taxation, and tax

Table 4.2: Choice Attributes and Attribute Levels

Attribute	Level
Fuel taxes	3, 4, 5, 6, 7, 8, 9 SEK/litre
Mileage tax in cities	
Electric cars	No mileage tax, 1, 2, 3, 4 SEK/mil
Diesel and petrol cars	No mileage tax, 2, 4, 5, 6 SEK/mil
Mileage tax in highways and rural areas	
Electric cars	No mileage tax, 1, 2 SEK/mil
Diesel and petrol cars	No mileage tax, 1, 2 SEK/mil

differentiation between location and vehicle type. Additionally, these attributes are all in number format, making them easier to compare for participants. For the fuel tax, SEK per litre was chosen, because converting the fuel tax burden to a mileage base depends on individual characteristics (e.g., fuel efficiency of the car, driving behavior), making an average likely to misrepresent reality. Furthermore, individuals are assumed not to readily convert the fuel tax into a mileage based burden either.

The levels for the mileage tax follow the Swedish convention of expressing distance based measures in per mil, which corresponds to ten kilometers.

Developing an experimental design consists of constructing choice sets from the previously specified attribute levels. Choice sets include different options representing specific attribute levels. Huber et al. (2019) remark that the minimum requirement of alternatives is two, out of which one may be a status quo option as a baseline.

In the present study, three options were presented per choice set. A status quo option consisting of only fuel tax and no mileage tax, and two mileage tax proposals with levels varying accordingly to the attribute levels described above. This enables the overall acceptability of the vehicle mileage tax next to identification of preferred tax levels (see Carattini et al., 2017).

An exemplary choice set is given in Table 4.3. Due to the numerical nature of all attribute levels, it was expected that the decision task was cognitively demanding. To lessen the cognitive burden, the overall intention of the mileage tax was explained once more in the following instruction given to participants before the choice set:

> Consider the policy tax reform described above and answer below which policy proposal you are most willing to accept. You will make in total 6 choices following each other. In each choice you are presented with two policy proposals besides the current policy. The proposals imply that the total tax payment per kilometre will be lower in rural areas and higher in large cities. In some proposals, a mileage tax is imposed on electric cars only as diesel and petrol cars are expected to be replaced by electric cars in the future.
>
> In the next pages, it is important to choose the alternative that you are most willing to accept. Please answer as truthfully as possible. Please,

read the questions and choice situations in the following pages carefully.

To gather data about the most acceptable tax levels, regardless of the overall acceptability of the tax, an additional choice question solely between tax reform proposals was presented, if participants initially chose to keep the status quo. The initial choice, however, was not changeable ex post to prevent spillover effects from choosing between the two reform proposals.

Table 4.3: Exemplary Choice Set

	Mileage and Fuel Tax After 2030 Proposal 1	**Mileage and Fuel Tax After 2030 Proposal 2**	**Only Fuel Tax Without Mileage Tax After 2030**
Fuel taxes	3 SEK/litre	6 SEK/litre	6 SEK/litre
Mileage tax in cities			
Electric cars	4 SEK/mil	2 SEK/mil	No mileage tax
Diesel and petrol cars	5 SEK/mil	5 SEK/mil	No mileage tax
Mileage tax in highways and rural areas			
Electric cars	2 SEK/mil	No mileage tax	No mileage tax
Diesel and petrol cars	1 SEK/mil	No mileage tax	No mileage tax
I am most willing to accept	□	□	□
Of the proposals, I am most willing to accept*	□	□	

* The last question was only shown to participants if their primary choice was the current policy. Their primary choice was recorded and participants were unable to retroactively change their first decision.

If all levels of every attribute are combined with every level of all other attributes, the design is an orthogonal fully factorial design (Holmes et al., 2017). This means that all main and interaction effects can be identified, because they are statistically independent (Holmes et al., 2017).

The present attributes and attribute levels would result in $7 \times 5^2 \times 3^2 = 1,575$ required choices for a full factorial design. Constructing a survey with this many choice sets is, of course, a little bit difficult to achieve. Fortunately, it is possible to reduce the number of choice sets required for statistically efficient choice experiments, by minimizing the model-parameter scaled variance-covariance matrix (Holmes et al., 2017). A so called *D*-efficient design was estimated using Ngene (Choice Metrics, 2020).

After excluding unrealistic combinations, twelve choice sets were identified for usage, which can be found in Appendix B.2. The cognitive burden on respondents can be further decreased by splitting choice sets into blocks, to limit the number of choices a given individual has to make. Here, two blocks of six choice sets each were used, which is a common number in choice experiments (Holmes et al., 2017).

Questionnaire development and data collection are the same for choice experiments as for other empirical methods. For this study they have been outlined in chapter 3 and section 4.1. Because choice experiments require choices to be made independently and without strategic comparison, computer-based surveys are especially appealing (Holmes et al., 2017). In addition to making choices irreversible, they allow for easy randomization of the order in which participants are shown the choice set. Both measures where used in the online survey.

Model estimation of choice experiments is done with a number of econometric methods such as multinominal logit, conditional logit, or other advanced regression techniques depending on the assumptions and the type of utility functions used in

the model (for an overview, benefits, and limitations of the different approaches, see Holmes et al., 2017).

However, all are based on the random utility maximization (RUM) model, which shall be briefly summarized in regards to main assumption and implications based on the chapter on discrete choice experiments by Holmes et al. (2017).

The random utility maximization model holds the basic assumption that individuals know their utility without error but analysts cannot observe it perfectly. Thus, the observed choice a respondent makes depends on the utility each option has to the respondent and a random error term which holds the option's characteristics that are unobservable to the researcher but included in the decision of the respondent. An option is chosen by a respondent if, and only if, its total utility is greater than that of alternative options.

This utility function is further commonly assumed to be linear. This results in the following equation for identifying the utility v an individual k receives from choosing an option i:

$$v_{ik} = \beta Z_i + \lambda(y_k - p_i) + \varepsilon_{ik}, \tag{4.1}$$

where β is a vector of non-monetary attributes' preference parameters, λ the marginal utility of money, y_k is income, p_i the cost of Alternative i and ε_{ik} the random error term with zero mean.

Because respondents are forced to make a decision between different alternatives, the absolute level of utility is irrelevant to the choice. Responses are given purely on *differences* in utility between the alternatives. As a result, variables that stay constant across alternatives (e.g., a person's income) falls out of the model. This carries important implications for the choice of the right analysis model, because they differ in the way socio-economic characteristics can be included. It further requires one alternative to be set as a baseline for labeled experiments (that is the choice options carry labels e.g., "Proposal 1") and experiments including status quo alternatives.

In this study, the choice experiment was analyzed using a conditional logit model, which is further described in subsection 4.6.2

4.4 Background Statistics

Socio-economic background data were collected at the end of the survey. Additionally, questions assessed travel related behavior and beliefs. Furthermore, attitudes toward the environment were measured using the environmental concern scale ($\alpha = 0.95$) by Wesley Schultz (2001). The scale uses one statement, "I am concerned about environmental problems because of the consequences for –", for twelve Likert-scale items (e.g., my health, animals, future generations) rated on seven verbally anchored points (ranging from *Not at all important* – *Neutral* – *Extremely Important*). The result is three correlated dimensions of environmental concern: egoistic concern ($\alpha = 0.92$, altruistic concern ($\alpha = 0.91$) and biospheric concern ($\alpha = 0.93$).

4.5 Method Limitations

The methods used in this study all come with limitations, which should be kept in mind for the following analysis and conclusion chapter. Methodological limitations are discussed following the same structure this chapter followed so far: from most generic to specific and in the order they appear in the study design.

4.5.1 Online Survey Experiments

Unlike laboratory settings, online surveys do not allow for controlling all aspects of the experimental setting. Test motivation can also play a role in survey settings, especially in long and burdensome surveys such as this study. Additionally, respondents cannot ask questions to clarify instructions in case they should be confusing.

Further, data on non-responses was not included. Thus, it is not possible to test whether people systematically stopped responding to the survey.

A common indicator for these issues is data on the duration a respondent spent answering the survey. Unfortunately this type of data was unavailable for this study.

However, online survey experiments allow for considerably larger sample sizes, which should mitigate error effects.

The inherent trade off between internal and external validity is further justified by the applied focus of this study.

4.5.2 Framing Experiments

From a methodological standpoint the framing experiment is subject to two main sources of potential error.

The first being the construction of treatments. It is possible that the messages are not salient enough to elicit measurable differences in attitude towards the message. The main reasons are the complex and demanding background information, which precedes the framed messages and the somewhat unclear origin of the message, as no message source is declared.

Another, serious limitation of the framing experiment stems from the fact that the single-item measure of perceived fairness erroneously omitted one response option *6 = fair*. The result is an item, which does not fulfill the Likert-scale property of approximately equidistant response options.

4.5.3 Choice Experiments

Despite their popularity, choice experiments, like any method, come with limitations. For using D-efficiency as in this case, pilots are usually needed to estimate priors, or focus groups to ensure that the attribute levels have been specified correctly Holmes et al. (2017). Either approach helps in ensuring correctly specified attributes and attribute levels. Due to time constraints however, this thesis now replaces a pilot study, which was originally intended to be carried out in advance. To compensate, the sample size was increased.

4.6 Analysis Methods

The data was mainly analyzed using R 4.0.0 (R Core Team, 2020), the lavaan package for structural equation modeling (Rosseel, 2012), as well as further packages for data manipulation, graphing and table exporting. The choice experiment was analyzed in Stata 14 (StataCorp, 2015). The full reproducible code can be found in section C.1, together with additional information on the collected data.

The following sections conclude the methods chapter by outlining the statistical procedures used to analyze the framing and choice experiment.

4.6.1 Framing Experiment

The framing experiment was analyzed using structural equation modeling. Structural equation modeling (SEM) encompasses a group of statistical procedures, most importantly factor analysis and regression (Kline, 2015).

It combines the advantages of latent construct methods, most importantly controlling for measurement error, with regression testing for outcome dependency (Breitsohl, 2019). In SEM, the part concerned with estimating latent constructs is called a measurement model; the regression analysis is called structural model (Kline, 2015).

Although often wrongly assumed, SEM, much like other regression techniques, cannot by itself establish causality (Kline, 2015). In his book, Kline (2015) therefore stresses the importance of theory guidance in specifying structural equation models if one intents to establish causality.

In this study, two already established models are combined into one partially latent structural regression model. The structural part was largely adapted from Jakobsson et al.'s (2000) road pricing acceptability model, while Dillard and Shen (2005) provide the measurement model for psychological reactance.

The goal of SEM is not to prove a given model right, but find one that fits empirical data, makes theoretical sense and is reasonably parsimonious i.e., simple in its explanation (Kline, 2015).

For this study a SEM approach was chosen, to improve theoretical sense of the model for road pricing acceptability by expanding it with a more refined understanding of infringement of freedom.

While it is technically possible to conduct analyses of between group comparisons, such as between treatment groups in experiments, doing so poses high requirements to data quality and methodological understanding (Breitsohl, 2019; Kline, 2015). Both cannot be considered as given in this study to the standards necessary and therefore, a simpler approach is chosen to analyze treatment effects.

A series of regressions allows for testing of hypotheses and controlling of potential influencing socio-demographic variables. This step-wise approach has been used in other research on message framing (e.g., Shen, 2010)

4.6.2 Choice Experiment

The response data for the choice experiment was analyzed using a a conditional logit model. The probability of a respondent k choosing one option over another

$(i = 1, ..., N)$, in a given choice is

$$P_{ik} = \frac{\exp(\mu v_{ik})}{\sum_{j=1}^{N} \exp(\mu v_{jk})} \tag{4.2}$$

where v is the perceived utility of the option and μ a scale parameter reflecting the unobserved utility's variance (Holmes et al., 2017). In the basic multi-nominal model this scaling parameter is set to one.

Thus, the model requires two assumptions to be made (Holmes et al., 2017):

1. Equal preference structure in the studied population.

2. Independence of irrelevant alternatives, that is the choice made in any given choice set is unaffected by other choice sets shown to respondents.

The coefficients obtained from logit regressions are in the form of log-odds, making them difficult to analyze in a meaningful way. Therefore, they were transformed into average mean effects, which can be interpreted like coefficients in OLS regressions: a one unit change from the mean of the independent variable results in a corresponding percentage change in the probability of choosing an alternative.

Chapter 5

Empirical Analysis

5.1 Results

The results are presented in the order that the experiments were conducted in the study. First, the framing experiment is analyzed, then the choice experiment. Afterwards, the results of both experiments are discussed; separately as well as jointly.

5.1.1 Framing Experiment

The framing experiment is analyzed in a three-folded manner. First, structural equation modeling tests the proposed determinants of road pricing acceptability (fairness and reactance). In doing so, the arousal of psychological reactance, as an amalgamation of anger and negative thoughts, is tested in a confirmatory factor analysis.

Afterwards, the four treatment groups are examined separately in regards to their sample characteristics, before hypotheses concerning framing effects are tested in a series of regressions.

Structural Equation Model

To identify if a model was correctly specified, i.e., that it fits the data well, various goodness-of-fit measures are recommended to be jointly examined. They aim at identifying the model's ability to reproduce the empirical data, but do so in different ways.

The starting point, χ^2, indicates the discrepancy between observed and model implied correlations. Unlike most other statistical procedures, a statistically significant χ^2 test can indicate poor model fit, because it points to a difference between the tested model and the observed data (Kline, 2015). However, large sample sizes and many degrees of freedom (observations - estimated parameters) can make this indicator overly sensitive (Kline, 2015). It is therefore generally recommended to approach goodness-of-fit evaluations for structural equation models (SEM) holistically, based on multiple indicators (Gerbing & Anderson, 1992).

According to Kline (2015), the most common approach is using incremental fit indices, which compare the estimated model against a baseline, where all parameters (i.e., paths and covariances) are fixed to zero. He recommends reporting at least three additional measures to complement χ^2:

1. The Comparative Fit Index (CFI) can range from 0 to 1 and indicates a comparison between the fitted model and a null model that assumes no relationship between measured items. Cutoffs commonly used to indicate adequate and good model fit are CFI>0.9 and CFI> 0.95, respectively.

2. The Root Mean Square Error of Approximation (RMSEA) is a scaled badness-of-fit statistic with results ranging from 0 to 1. Models with low degrees of freedom and small sample sizes are penalized by this measure. The recommended cut off is 0.06, with the upper 90% confidence interval ideally not exceeding 0.08.

3. The Standardized Root Mean Square Residual (SRMR) gives the standardized difference between the observed correlation and the predicted correlation. Values higher than 0.10 can indicate poor model fit.

Testing of the intertwined model of psychological reactance was done in a strictly confirmatory approach. First, because the model has emerged as the best conceptualization of reactance arousal (Rains, 2013) and second, because only the presence, not the structure of reactance is of interest in this study. Figure 5.1 shows the standardized parameter estimates for each factor loading; oval represent latent factors; rectangles observed (manifest) data, labeled by their variable name; circular arrows represent disturbance (error) terms. The figure can be read as: Threat to freedom is measured by variables a4_1 to a4_3 and predicts reactance. Because theory suggests that these predictions can, in this case, be interpreted as causal (Dillard & Shen, 2005; Rains, 2013) one can conclude: Threat to freedom causes reactance, which in turn is indicated by both anger and negative cognition.

Overall, all latent factors were well indicated by the measured item scores. The model paths were significant and overall model fit was good. Although $\chi^2 = 61.46$ was statistically significant ($p < 0.001, df = 32$), the other indicators point towards a good model fit. Comparative Fit Index (CFI) was over the recommended 0.95 (CFI = 0.999). The Root Mean Square Error of Approximation (RMSEA) was 0.048 and the upper 90 % confidence interval (0.065) did not reach 0.08.

Therefore, the intertwined process model of reactance can be used to explain the collected data. Hypotheses H_{2a} and H_{2b}, about threat to freedom positively predicting anger and negative cognition, are supported.

The influence of reactance and perceived fairness was tested jointly by adding a structural model to the confirmatory factor analysis of reactance. Figure 5.2 shows the standardized path coefficients. The two items for support and acceptance were combined into one latent measure of acceptability.

For the full model, the fit is less clear to evaluate than the confirmatory factor analysis model of reactance. χ^2 was significant ($p < 0.001$) at 1248.20 with 62 degrees of freedom. CFI was just above the 0.95 cut-off (0.952) and SRMR (0.039) well below the recommended threshold of 0.10. However, RMSEA was 0.217 with an upper 90% CI at 0.228, well above the recommended 0.06 (0.08 for upper CI).

A possible reason for this increase in RMSEA could be the increased number of degrees of freedom. Another possible reason could be that important determinant variables were omitted from the model so far, for example treatment effects.

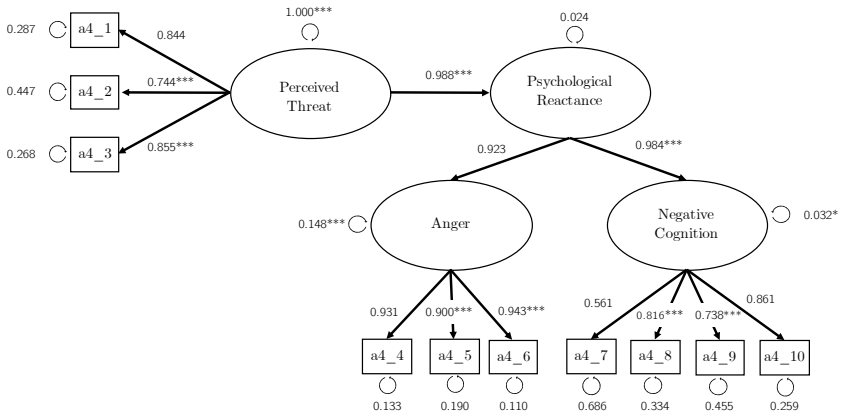


Figure 5.1: Standardized Path Coefficients for the Intertwined Reactance Model. $^{*}p<0.1$; $^{**}p<0.05$; $^{***}p<0.01$, $\chi^2 = 61.46$, $df = 32, p < 0.001$, $CFI = 0.999$

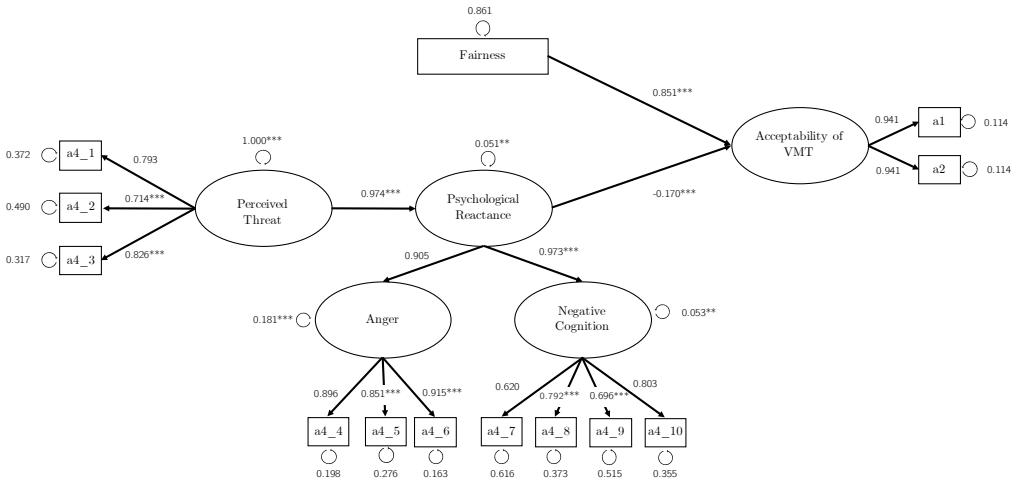


Figure 5.2: Standardized Path Coefficients for the VMT Acceptability Model. $^{*}p<0.1$; $^{**}p<0.05$; $^{***}p<0.01$, $\chi^2 = 1248.30$, $df = 62$, $p < .001$, $CFI = 0.953$

Bearing this in mind, an inspection of the paths from fairness and reactance to acceptability reveals significant coefficients. Their direction is consistent with the expectations formulated in H_1, i.e., that fairness positively predicts acceptability, and H_2, that reactance negatively predicts acceptability of the reform proposal. The Hypotheses are supported.

The magnitude of the paths is further remarkable. While reactance appears to have only a small negative influence on acceptability (-0.170), perceived fairness seems to predict acceptability extremely well (0.851).

At this point, H_3 receives partial support. The endogenous elements of the VMT acceptability model (fairness, reactance and acceptability) are congruent with the empirical evidence.

H_3 further includes an exogenous influence, the policy proposal (Figure 2.4), which has not yet been included in the analysis. To fully support or reject H_3, treatment effects ought to be considered.

Table 5.1 shows the mean, standard deviation, and correlation for the two main experiment factors (tax and change emphasis) and the outcome variables as composite scales. Correlations between the treatment factors and outcome variables are all close to zero. The following sub-sections will examine the framing effects.

Table 5.1: Correlation Table for Framing Experiment

	Mean	**SD**	**1**	**2**	**3**	**4**	**5**	**6**	**7**
1. Change [a]	0.538	0.499	1						
2. Tax	0.509	0.501	-0.093	1					
3. Threat [b]	3.989	1.474	0.044	0.024	1				
4. Anger	3.729	1.728	0.015	0.039	0.793	1			
5. Neg. Cognition	3.956	1.340	0.016	0.035	0.799	0.777	1		
6. Fairness	3.418	1.606	-0.072	-0.044	-0.46	-0.581	-0.409	1	
7. Acceptability	3.823	1.860	-0.033	-0.021	-0.468	-0.612	-0.439	0.828	1

[a] Change and Tax denote dummy variables coded 0/1 for the absence/presence of the tax label, or the change condition. Due to slightly uneven group sizes, their mean is not exactly 0.5.
[b] Scale composites used for the following variables.

Treatment Groups

The treatment randomization resulted in four, slightly uneven groups. The groups were however very similar in the characteristics of respondents. Their descriptive data is displayed in Table 5.2.

Table 5.2: Descriptive Data of Treatment Groups

		Treatment			
	Total Sample	**Keep Subsidies**	**Keep Taxes**	**Reduce Subsidies**	**Increase Taxes**
Age	M = 47.59, SD = 17.65	M = 47.2, SD = 18.1	M = 47.6, SD = 18	M = 45.5, SD = 17.1	M = 50.3, SD = 17.5
Male	50.12%	46.99%	46.67%	52.99%	46.15%
Rural	50.12%	42.17%	40.95%	45.30%	46.15%
No Car Access	32.44%	36.14%	32.38%	33.33%	24.79%
Income[a]					
Below 25 SEK	51.35%	51.81%	50.48%	57.26%	39.32%
Between 25 and 40 SEK	33.16%	27.71%	33.33%	30.77%	35.04%
Above 40 SEK	15.48%	20.48%	16.19%	11.97%	12.82%
n	407	83	105	117	102

Note: [a] Income in thousands; missings not included.

Treatment Effects

The relevant outcome variables were measured on seven-point Likert items, and combined to composite scales. Perceived fairness is an exception to this in two ways: first, the construct was measured as a single item and second, said item mistakenly omitted an anchor, resulting in a response range of six instead of seven.

Figure 5.3 shows the boxplots for every outcome construct by treatment group. The impression from the correlations (Table 5.1) is reinforced by the distribution of outcome ratings. The only slight deviance between treatment groups can be identified on the fairness rating, where the increase taxes condition yielded lower ratings than the other three treatment conditions. It is again important to keep in mind that this item was recorded on a six response scale, not seven like the others.

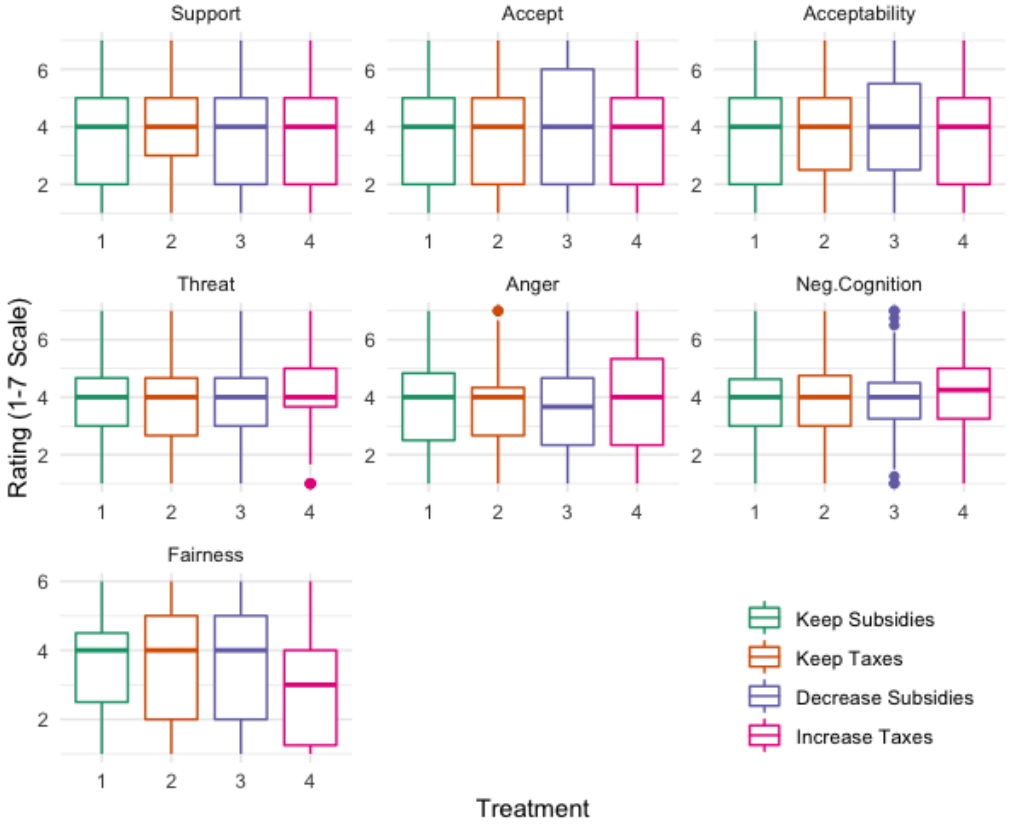


Figure 5.3: Boxplots of All Outcome Variables by Treatment Group. Acceptability Shows Items Acceptance and Support Combined. Threat, Anger and Negative Cognition Show Scale Means for Reactance Measurement. Expected Differences Due to Treatment Conditions Appear Absent.

To formally test for treatment effects a series of regressions was estimated. Multiple linear regressions on composite-scales were used for the constructs reactance and acceptability; responses to the fairness item were analyzed using binary logit-regressions.

Acceptability and reactance were treated as interval data by using scale means. Although considerable debate about the appropriateness of this procedure exists in literature (e.g., Carifio & Perla, 2007; Liddell & Kruschke, 2018), it was deemed acceptable for this study for two main reasons. One, the reactance items loaded highly on their latent factors in the reactance measurement model, with good model fit;

two, both the combined reactance and the combined acceptability scale exhibit good reliability scores with alpha reliabilities approximately 0.94 and 0.92, respectively. Thus, acceptability and reactance meet proposed requirements for using Likert-scale as interval data (see Carifio & Perla, 2007).

While these assumptions allow for they inclusion of cceptability and reactance measures in ordinary least squares (OLS) regression, perceived fairness does meet these requirements. On one hand, a single item should generally not be treated as being interval scaled (Carifio & Perla, 2007) and more importantly, the missing anchor makes the distance between *somewhat fair* and *very fair* impossible to argue as approximately equal. To compensate, a series of binary logistic regressions was performed on on each recorded answer category of this item. In this procedure, instead of measuring the change in an interval scaled outcome variable based on a set of predictors, the probability of choosing each response level is estimated.

Each regression was performed twice: once including only dummy variables for each treatment condition, with "keep subsidies" as the baseline condition; and once controlling for a set of socio-demographic variables.

The dummy variable "Keep Taxes" refers to the tax label condition, so does the interaction dummy "Increase Taxes". The condition "Reduce Subsidies" is the main effect of the change framing.

A disadvantage to the approach with separate regressions, compared to SEM, is that measurement error can no longer be controlled for through latent constructs. This is especially true for the fairness item, which is expected to include considerable measurement error, due to its faulty response scale.

The results of the fairness item analysis are presented in Table 5.3, the results from OLS regressions are presented in Table 5.4. Their results are discussed per outcome in the following paragraphs.

Treatment effects on perceived fairness of a vehicle mileage tax are the first to be analyzed.

The binary logit-regression results are presented as odds ratios (OR), which represent the probability of an event occurring compared to the probability of the event not occurring. For example, in (1), the one unit increase from no tax increase (coded 0) condition to tax increase condition (coded 1) reduces the probability of choosing a rating higher than *very unfair* by approximately half (1 - OR of 0.494), this change is significant at $p < 0.05$. Indeed, the treatment message "Increase Taxes" raises the odds of rating the policy proposal as *very unfair, unfair* or *somewhat unfair*, compared to rating it more favorably (significant OR below 1). The direction remains for all response options, but is not significant for the probabilities of rating the policy as neutral or any level of fair.

Other treatment effects had no clear significant effects.

Thus, H_4, that taxes are considered more unfair than subsidies under the stability condition, is rejected. Hypothesis 5, that under the change condition, the tax label (Increase Taxes) is perceived as more unfair than the subsidy label (Reduce Subsides), is supported.

Additionally, by including covariates, it emerges that having no car, or no regular access to a car, decreases the odds of rating the policy proposal on a negative response anchor, but does not necessarily imply an increase in likelihood of rating the policy as fair.

Table 5.3: Framing Experiment Treatment Effects — Regression Results for Fairness Item

	Odds ratio for response rating:									
	Unfair		Somewhat Unfair		Neutral		Somewhat Fair		Very Fair	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Tax Main Effect (Keep Tax)	0.940	0.946	0.773	0.773	1.053	1.012	1.674	1.583	1.032	1.046
	t = −0.149	t = −0.132	t = −0.782	t = −0.765	t = 0.174	t = 0.038	t = 1.591	t = 1.347	t = 0.069	t = 0.096
Change Main Effect (Reduce Subsidy)	0.930	0.904	0.862	0.842	1.147	1.148	1.064	1.082	0.682	0.765
	t = −0.181	t = −0.246	t = −0.456	t = −0.518	t = 0.476	t = 0.466	t = 0.190	t = 0.229	t = −0.810	t = −0.543
Change × Tax Effect (Increase Tax)	0.494	0.453	0.465	0.458	0.728	0.647	0.959	0.722	0.793	0.659
	t = −1.827*	t = −1.975**	t = −2.377**	t = −2.352**	t = −1.070	t = −1.402	t = −0.124	t = −0.900	t = −0.488	t = −0.836
Male		1.114		1.163		1.405		1.588		2.126
		t = 0.392		t = 0.669		t = 1.611		t = 1.929*		t = 2.099**
Rural		0.912		1.005		1.202		1.373		1.388
		t = −0.314		t = 0.020		t = 0.817		t = 1.233		t = 0.874
Income [1]										
Between 25 and 40 SEK		1.231		1.035		1.367		1.287		1.707
		t = 0.659		t = 0.138		t = 1.326		t = 0.950		t = 1.384
Above 40 SEK		0.810		0.871		1.057		1.402		1.954
		t = −0.540		t = −0.420		t = 0.179		t = 0.967		t = 1.382
No Car Access		2.418		1.958		2.195		0.991		1.901
		t = 2.474**		t = 2.488**		t = 3.205***		t = −0.032		t = 1.618
Environmental Concern		1.236		1.089		1.106		1.366		1.207
		t = 1.879*		t = 0.897		t = 1.126		t = 2.854***		t = 1.215
Age		0.996		0.996		1.013		1.026		1.034
		t = −0.458		t = −0.675		t = 2.170**		t = 3.687***		t = 3.148***
Constant	5.917	1.866	2.952	1.810	1.128	0.196	0.339	0.011	0.137	0.003
	t = 5.696***	t = 0.752	t = 4.288***	t = 0.859	t = 0.548	t = −2.493**	t = −4.288***	t = −5.395***	t = −5.895***	t = −4.752***
Observations	407	407	407	407	407	407	407	407	407	407
Log Likelihood	−187.242	−180.602	−250.547	−245.623	−280.119	−271.900	−240.119	−225.244	−136.724	−127.235
Akaike Inf. Crit.	382.484	383.204	509.094	513.245	568.238	565.801	488.238	472.488	281.448	276.469

Note: [1] In thousands. *t*-values for linear model, not exponentiated odds-ratio. *p<0.1; **p<0.05; ***p<0.01

Treatment effects on reactance towards the proposal of a vehicle mileage tax are examined next.

Figure 5.3 and the constants in regression (3) and (4) in Table 5.4 demonstrate that people did experience some, but not much, reactance towards the proposed vehicle mileage tax.

Further, the extent to which reactance was aroused did not depend on the treatment status. H_6, H_7, and H_8 are correspondingly rejected.

Having no car or regular car access acted as an antecedent to reactance, as did high concern for the environment (-0.390, $p < 0.05$ and -0.100, $p < 0.1$, respectively).

All model fits were acceptable ($R^2 > 0.7$).

Table 5.4: Framing Experiment Treatment Effects — Regression Results for Acceptability and Reactance

	Dependent variable:			
	Acceptability		Reactance	
	(1)	(2)	(3)	(4)
Tax Main Effect (Keep Tax)	−0.002	−0.045	−0.076	−0.079
	(0.144)	(0.145)	(0.109)	(0.145)
Change Main Effect (Reduce Subsidy)	0.041	0.017	−0.175*	−0.165
	(0.142)	(0.142)	(0.099)	(0.142)
Change × Tax Effect (Increase Tax)	0.214	0.128	−0.017	0.005
	(0.156)	(0.155)	(0.108)	(0.155)
Reactance	−0.213***	−0.214***		
	(0.053)	(0.054)		
Threat to Freedom			0.812***	0.808
			(0.026)	(0.053)
Fairness[a]				
Unfair	1.033***	1.019***		
	(0.175)	(0.173)		
Somewhat Unfair	2.423***	2.464***		
	(0.172)	(0.174)		
Neutral	2.590***	2.650***		
	(0.169)	(0.177)		
Somewhat Fair	3.737***	3.680***		
	(0.160)	(0.159)		
Very Fair	4.351***	4.311***		
	(0.285)	(0.287)		
Male		0.061		0.014
		(0.102)		(0.102)
Rural		0.176*		0.095
		(0.107)		(0.107)
Income[b]				
Between 25 and 40 SEK		0.062		0.089
		(0.115)		(0.115)
Above 40 SEK		−0.003		0.061
		(0.146)		(0.146)
No Car Access		−0.104		−0.002
		(0.122)		(0.122)
Environmental Concern		0.100**		−0.075
		(0.046)		(0.046)
Age		0.002		−0.001
		(0.003)		(0.003)
Constant	2.302***	1.597***	0.695***	1.045**
	(0.313)	(0.455)	(0.130)	(0.455)
F Statistic	217.48*** (df = 9; 397)	121.66*** (df = 16; 390)	252.92 (df = 4; 402)	97.72* (df = 11; 395)
Observations	407	407	407	407
R^2	0.725	0.733	0.715	0.721
Adjusted R^2	0.719	0.722	0.712	0.714
Residual Std. Error	0.986 (df = 397)	0.981 (df = 390)	0.762 (df = 402)	0.760 (df = 395)

Note: Robust Standard Errors in Parentheses. *p<0.1; **p<0.05; ***p<0.01

[a] Response *Very Unfair* as baseline. [b] Income in thousands.

Treatment effects on the acceptability of a vehicle mileage tax are non-significant as well. This remains unchanged, when controlling for socio-demographic variables. Given the high similarity of treatment groups and the previous results for fairness and reactance, this is of course expected.

Unsurprisingly, given the previous analysis via SEM, reactance and perceived fairness again emerge in the expected direction as significant predictors of acceptability.

Although H_9, H_{10}, and H_{11}, about treatment effects on policy acceptability, are rejected, it is notable that the proposed vehicle mileage tax appears is, on average, received rather neutrally.

Consequently, Hypothesis 3, concerning overall model fit, is rejected as well. The proposed model in Figure 2.4 does not match the observed data. The communication of the proposal did not measurably influence acceptability or one of its determinants.

Interestingly, income and car access do not play a statistically significant role in explaining acceptability rating either.

Living in rural areas leads to a small, significant increase (0.176, $p < 0.1$) in acceptability, which supports H_{13}.

The influence of individual and policy characteristics is explored in the next section.

5.1.2 Choice Experiment

Before beginning the statistical testing of the choice outcomes, the data was screened for recording error and reshaped, so that an observation corresponds to a decision on a choice set. Six observations had to be dropped because they did not include information about the original order of the randomized choice sets. Respondents were asked to state which alternative they are most willing to accept. If the first choice rejected the proposed vehicle mileage tax in favor of maintaining only fuel taxes, participants were asked to make another choice, this time only between the vehicle mileage taxation alternatives. This results in 7218 observations for the first choice (401 respondents $\times$ 6 choice set $\times$ 3 alternatives) and 4812 for the second choice.

The regression results in Table 5.5, Table 5.6 and Table 5.7 report the probability of a given alternative being chosen and present the marginal effect at the mean for changes in choice attributes, as well as respondent characteristics. They can be interpreted as, follows: at the means of the explanatory variables, the probability of choosing a proposal is given atop the table by P(choice | selected). Each explanatory variable presents a mean, from which a one unit increase leads to a corresponding change in choice probability.

Hypotheses Testing

The analysis of the choice experiment results is initiated by testing the stipulated hypotheses. Afterwards, the overall acceptability of vehicle mileage tax proposals is reviewed.

The overall tax rate magnitude is found to be a significant negative predictor for the likelihood of choosing an alternative.

Table 5.5: Choice Experiment — Marginal Effects at Means for the First Choice

		Alternative 1		**Alternative 2**		**Alternative 3**	
		P = 0.320		P = 0.313		P = 0.367	
	M	**dp/dx**	**SE**	**dp/dx**	**SE**	**dp/dx**	**SE**
Fuel Tax Rate							
1	4.49	-0.028***	(0.006)	0.013***	(0.003)	0.015***	(0.003)
2	6.97	0.013***	(0.003)	-0.028***	(0.006)	0.015***	(0.003)
3	7.54	0.015***	(0.003)	0.015***	(0.003)	-0.03***	(0.007)
VMT Rate[a]							
Cities EV							
1	3.05	-0.012*	(0.006)	0.006*	(0.003)	0.007*	(0.003)
2	2.64	0.006*	(0.003)	-0.012*	(0.006)	0.007*	(0.003)
3	0	0.007*	(0.003)	0.007*	(0.003)	-0.013*	(0.007)
Cities CV							
1	3.68	0.004	(0.009)	-0.002	(0.004)	-0.002	(0.005)
2	0	-0.002	(0.004)	0.003	(0.009)	-0.002	(0.005)
3	0	-0.002	(0.005)	-0.002	(0.005)	0.004	(0.010)
Rural EV							
1	0.94	-0.025	(0.010)	0.012	(0.005)	0.014	(0.005)
2	0.86	0.012	(0.005)	-0.025	(0.010)	0.013	(0.005)
3	0	0.014	(0.005)	0.013	(0.005)	-0.027	(0.011)
Rural CV							
1	1	-0.021	(0.017)	0.010	(0.008)	0.011	(0.009)
2	0	0.010	(0.008)	-0.021	(0.017)	0.011	(0.009)
3	0	0.011	(0.009)	0.011	(0.009)	-0.022	(0.019)

Note: dp/dx for factor levels is the discrete change from the base level. The dummy variable bases for male, rural and no car access were set to 0.

[a] EV = Electrical Vehicle, CV = Conventional Vehicle. *p<0.1; **p<0.05; ***p<0.01

Table 5.6: Choice Experiment — Marginal Effects at Means for the First Choice, Including Individual Covariate

		Alternative 1		**Alternative 2**		**Alternative 3**	
		P = 0.272		P = 0.309		P = 0.420	
	M	**dp/dx**	**SE**	**dp/dx**	**SE**	**dp/dx**	**SE**
Fuel Tax Rate							
1	4.49	-0.027***	(0.006)	0.012***	(0.003)	0.016***	(0.003)
2	6.97	0.012***	(0.003)	-0.03***	(0.006)	0.018***	(0.004)
3	7.54	0.016***	(0.003)	0.018***	(0.004)	-0.034***	(0.007)
VMT Rate[a]							
Cities EV							
1	3.05	-0.013**	(0.006)	0.005**	(0.003)	0.007**	(0.003)
2	2.64	0.005**	(0.003)	-0.014**	(0.006)	0.008**	(0.004)
3	0	0.007**	(0.003)	0.008**	(0.004)	-0.016**	(0.007)
Cities CV							
1	3.68	0.003	(0.008)	-0.001	(0.004)	-0.002	(0.005)
2	0	-0.001	(0.004)	0.003	(0.009)	-0.002	(0.005)
3	0	-0.002	(0.005)	-0.002	(0.005)	0.004	(0.01)
Rural EV							
1	0.94	-0.025**	(0.009)	0.010**	(0.004)	0.014**	(0.005)
2	0.86	0.010 **	(0.004)	-0.026**	(0.01)	0.016**	(0.006)
3	0	0.014**	(0.005)	0.016**	(0.006)	-0.03**	(0.011)
Rural CV							
1	1	-0.02	(0.016)	0.008	(0.007)	0.012	(0.009)
2	0	0.008	(0.007)	-0.022	(0.017)	0.013	(0.011)
3	0	0.012	(0.009)	0.013	(0.011)	-0.025	(0.02)
Individual Covariates							
Male	0	0.054**	(0.02)	0.025**	(0.02)	-0.079**	(0.021)
Rural	0	0.041**	(0.02)	0.012**	(0.021)	-0.053**	(0.023)
Age	47.38	0.00	(0.001)	-0.001	(0.001)	0.001	(0.001)
Income group	4.45	-0.002	(0.004)	0.005	(0.004)	-0.003	(0.004)
No Car Access	0.000	-0.018	(0.021)	-0.033	(0.022)	0.052	(0.025)
Tax Excess Belief	4.25	-0.031***	(0.006)	-0.004***	(0.007)	0.034***	(0.007)
Tax Cover Infrastructure Cost	4.75	0.01	(0.008)	0.012	(0.008)	-0.022	(0.009)
Tax Cover Environmental Cost	4.63	0.031	(0.008)	-0.026	(0.008)	-0.004	(0.009)
Technological Privacy Concern	4.65	0.004	(0.005)	0.002	(0.006)	-0.006	(0.006)
Environmental Concern	5.22	0.013	(0.008)	0.003	(0.009)	-0.016	(0.01)

Note: dp/dx for factor levels is the discrete change from the base level. The dummy variable bases for male, rural and no car access were set to 0.

[a] EV = Electrical Vehicle, CV = Conventional Vehicle. *p<0.1; **p<0.05; ***p<0.01

Table 5.7: Choice Experiment — Marginal Effects at Means for the Second Choice, Including Individual Covariate

		Alternative 1		Alternative 2	
		P = 0.418		P = 0.309	
	M	dp/dx	SE	dp/dx	SE
Fuel Tax Rate					
1	4.49	-0.028***	(0.007)	-0.029***	(0.007)
2	6.97	0.028***	(0.007)	0.029***	(0.007)
VMT Rate[a]					
Cities EV					
1	3.05	-0.02**	(0.006)	-0.021**	(0.006)
2	2.64	0.02**	(0.006)	0.021**	(0.006)
Cities CV					
1	3.68	-0.014	(0.01)	-0.014	(0.01)
2	0	0.014	(0.01)	0.014	(0.01)
Rural EV					
1	0.94	-0.005	(0.011)	-0.005	(0.011)
2	0.86	0.005	(0.011)	0.005	(0.011)
Rural CV					
1	1	-0.037**	(0.019)	-0.038**	(0.019)
2	0	0.037**	(0.019)	0.038**	(0.019)
Individual Covariates					
Male	0			0.053**	(0.021)
Rural	0			-0.013	(0.022)
Age	47.38			-0.001*	(0.001)
Income group	4.45			0.001	(0.004)
No Car Access	0			0.030	(0.024)
Tax Excess Belief	4.25			-0.027***	(0.007)
Tax Cover Infrastructure Cost	4.75			0.025**	(0.009)
Tax Cover Environmental Cost	4.63			0.025**	(0.009)
Technological Privacy Concern	4.65			-0.002	(0.006)
Environmental Concern	5.22			0.007	(0.009)

Note: The second choice only contained proposals with a VMT, therefore, only the data for choosing one alternative is shown. The probability for choosing proposal 2 is easily calculated by the converse probability of proposal 1. dp/dx for factor levels is the discrete change from the base level. The dummy variable bases for male, rural and no car access were set to 0. [a] EV = Electrical Vehicle, CV = Conventional Vehicle. *p<0.1; **p<0.05; ***p<0.01

This is true for the first and second choice, but only significant for fuel tax rates and VMT rates for electrical vehicles in cities. For example, a one unit increase from the mean fuel tax rate (4.49) of proposal 1, which is a VMT proposal, the probability of an individual choosing this proposal as most acceptably decreases by 0.028 percentage points.

Increases in other attribute levels, in addition to being non-significant, are too close to zero to credibly interpret in any way.

The picture changes only slightly, when respondent characteristics are included. The direction and significance of increases in fuel tax rates and inner-city VMT rates for electrical vehicles (EVs) remains, in addition, rate increases in rural areas for EVs become statistically significant in decreasing the choice probability.

Overall, enough evidence is found to support hypothesis 12, which stated that acceptability decreases with higher tax levels.

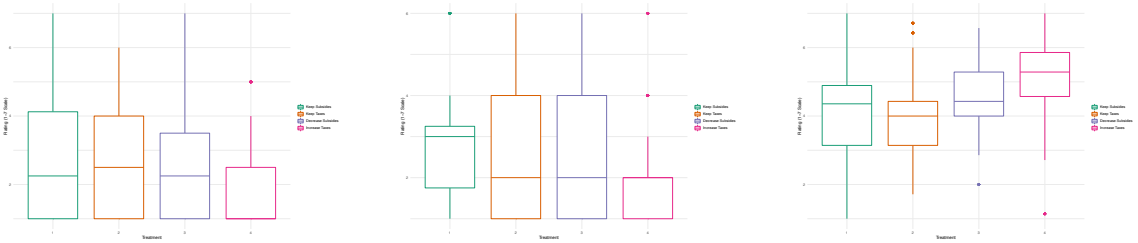
Living in rural areas emerged as a statistically significant positive predictor for the acceptability of vehicle mileage taxation in the framing experiment. This hypothesis is supported once more by the findings of the choice experiment. People living in rural areas, on average, are significantly more likely to vote for a proposal with a vehicle mileage tax, and less likely to select the proposal with only fuel taxes. The marginal effect of living in rural areas was not only the biggest of those measured, people in rural areas were also more likely to select proposal 1, which was the alternative with a higher VMT to fuel tax ratio.

Other influences on choice probability that were included in this analysis were tax and environmental related believes. One item measured the extent to which an individual believed current tax levels met costs of driving, ranging from *much smaller - about the same - much larger*. All else equal, higher ratings on this scale significantly reduce the probability of choosing a VMT alternative and in turn increase the probability of choosing the only fuel tax option by 0.034 percentage points. Environmental believes did not play a significant role in deciding choice outcomes, whether general, nor tax revenue related.

The probability of selecting a proposal which includes a vehicle mileage tax as most acceptable was not only higher than choosing fuel taxes for people living in rural areas. The combined probability of a VMT proposal (alternatives 1 and 2) being chosen was around 60%.

Closer inspection of individual votes revealed that out of the 401 individuals, only 100 had selected to keep only fuel taxation at least once. 81 of those, however, voted against vehicle mileage taxes every time.

This subset also disliked the proposed vehicle mileage tax during the framing experiment (see Figure 5.4. Reviews of similarities between these individuals were inconclusive. Additional graphic material for this subset can be found in section C.2.



(a) Acceptability *(b) Fairness* *(c) Reactance*

Figure 5.4: Boxplots of Framing Experiment Outcome Measures for Never VMT Voters, by Treatment Group

5.2 Discussion

Discussion of the results will follow the outline of the result section. First, the framing experiment will be discussed, then the choice experiment. A holistic perspective on the results then concludes this chapter.

5.2.1 Framing Experiment

The well supported and established models of reactance and road pricing are, once more, supported by this study. Considering the extensive literature on these topics and previous studies in different contexts, this is not surprising.

Contrary to the reviewed literature, however, framing did not lead to significant effects on the policy's reception. The only frame that managed to elicit a meaningful reaction from participants was the tax increase frame, and that only for the perceived policy fairness.

In this regard, two arguments regarding framing literature should be considered. One, although framing effects are overall very well established, they do not always emerge as significant or with meaningful magnitudes (Steiger & Kühberger, 2018). Krishen et al. (2010) point to regulatory fit, i.e., congruent message frame and personality traits, as an important mediator of frame effects.

Two, the reviewed literature on the influence of tax labeling has mainly been conducted in the anglo-saxon countries, predominately the USA. It can be speculated that Swedish people do not perceive taxation to the same extent as infringing on freedom, because of a different mentality towards taxation.

This speculation is somewhat countered by this study's finding that communication of increasing taxes is associated with higher odds of rating the vehicle mileage tax proposal as unfair. An interesting finding on fairness perception is its association with having no car or no access to one. Despite making it more likely that a the vehicle mileage tax would be considered as neutral rather than unfair, it did not increase the odds of rating the tax proposal as *fair*.

Further potential explanations for the null result of framing effects could, perhaps, be found in the extensive background information given to participants. Within said explanation, the words tax and subsidy occurred both and, more importantly, the proposed road pricing mechanism was constantly referred to as a vehicle mileage tax.

5.2.2 Choice Experiment

The results of the choice experiment are consistent with the first part of this study as well as the broader literature on tax perception.

People favor lower tax rates. This finding is equally unsurprising in comparison to the reviewed literature, as to intuition. Unexpectedly, however, car ownership was not meaningfully connected to choice probabilities.

Car ownership was only one of many potentially choice influencing individual characteristics. It is interesting that, despite concerns of some authors, such as Duncan and Graham (2013), privacy concerns did not play an important role in the acceptability of a vehicle mileage in this study.

Neither did environmental concerns, although it should be considered that environmental aspects did not overtake other stated reasons for the implementation of a vehicle mileage tax.

Perhaps somewhat surprisingly, also in light of the literature (e.g., Langer et al., 2017), the extent to which one believes the tax burden to be excessive was negatively associated with the probability of choosing a tax reform proposal. The information provided to respondents did not imply an overall change in tax burden, merely a redistribution, which for an individual could be net positive (for example, if they do not drive in cities often).

The resolute rejection of the tax proposal by 2% of this sample is especially intriguing in this regard.

5.2.3 Joint Discussion

Overall, the findings of both experiments complement and support each other well.

This is especially interesting for those cases, which remained extremely stable in their opinions and stated preferences across the experiments.

Perhaps explanations for this subset of respondents ought to be sought outside the scope of this study.

A number of studies point towards factors not considered in this research, as potentially influencing this policy's acceptability, such as perceived effectiveness of the proposed policy (Huber et al., 2019), stated purpose of the policy (Hysing & Isaksson, 2015). Others point to individual characteristics as useful determinants (e.g., general and specific trust in government; Kim et al., 2013), perhaps personality traits should also be considered in attempts to explain the resistance towards policy proposals, as the vehement opposition of this study persisted over different treatment effects and socio-demographic characteristics.

Chapter 6

Conclusion

6.1 Limitations

This study comes, as any, with limitations, which concern the scope and extent to which findings should be generalized to other contexts.

The study is limited in its external validity in so far, as it represents a single attempt at inducing framing effects. In reality, the implementation of a vehicle mileage tax is likely to be accompanied by different, simultaneously competing frames. The choice experiment is equally affected by this. In reality, the amount of (potential) choice alternatives an individual is confronted with is likely to exceed those presented in this study.

Additionally, the study's focus was on Sweden, which should be considered when attempting to extrapolate its findings to other countries with, potentially, idiosyncratic contexts.

The internal validity could potentially be impacted by individuals already having been pre-exposed to the topic, as it received some national attention in the weeks leading up to this study. Despite best efforts to control for measurement error in the framing experiment, it is of course essential that findings regarding perceived fairness are taken with a grain of salt.

6.2 Research Aims

The theoretical aims of this study were to advance understanding of policy acceptance by including a more nuanced perspective on infringement of freedoms.

The results demonstrate that the theory of psychological reactance, conceptualized as an amalgamation of anger and negative cognition over a perceived threat to freedom, can be considered a useful tool when researching policy acceptance.

The richness of psychological reactance theory is also useful for policy makers when thinking about and talking about implementing new policies. The motivational potential of reactance could, for example, be better navigated by understanding its underlying process.

6.3 Research Objectives

The two questions which guided this research were the economical and political feasibility of introducing a vehicle mileage tax in Sweden.

From the reviewed literature it quickly became evident that including taxation of vehicle mileage is the most beneficial way of addressing external costs of road usage. It allows for improvements in precision and equity of addressing external costs to driving, in addition to providing a solution to the pressing issue of generating sufficient tax revenue.

This study showed that lower tax rates are generally more acceptable and thus that increasing fuel taxes can be seen as less favorable by the public compared to reforming the way taxes are levied. This finding is independent of the way the policy is communicated, which did not influence the fairness, potential to arouse reactance, or acceptability a proposed switch to basing vehicle taxation on driving distance.

Which points to the second research question, regarding the political feasibility of introducing vehicle mileage taxes.

Here, the study contributes the finding that, overall, a vehicle mileage tax causes neither enthusiastic acceptance or support, nor widespread opposition, if proposed in general, abstract terms. Compared to alternatives of keeping or potentially even increasing fuel taxes, a vehicle mileage tax reform is even favored by a majority.

Therefore, at least in regards to the majority of the Swedish public, a vehicle mileage tax certainly is politically feasible.

However, a small minority remains, which is adamant in its opposition to any new tax.

6.4 Practical Implications

For policy makers there are some practical implications from this study, which should be considered when attempting to implement a vehicle mileage tax.

Although different frames did not yield measurable differences in affecting people's perception of the policy reform, some minor indications can be found that presenting a reform as a tax increase is more likely to be detrimental than beneficial. Given the decrease in choice probabilities associated with increases in tax rates, it is recommended that policy makers aim for introducing a vehicle mileage tax at rates that are close to the current tax level. In addition it should then be stressed that the overall tax does not increase and potentially even that otherwise already existing taxes would need to be increased.

Additionally, the reviewed theory provides some key considerations for the implementation process.

The complexity of fairness should be acknowledged and addressed holistically. It is not enough to state that the new tax would make the outcome fairer, instead procedural aspects of implementing the tax should be considered as well. Leventhal (1980) gives correctability of a process as one rule by which humans judge procedural fairness. The Stockholm case of congestion charges exemplifies the acceptance benefits of offering a possibility to repeal a reform. Additionally, the endowment effect expects people to be more reluctant to give something up, after it entered a persons endowment. Despite the null results in the framing experiment, it might, therefore, be highly advisable to policy makers to introduce a vehicle mileage tax as

a trial run. Thus giving people the option to repeal it, but giving them also enough time to become familiar with the new policy.

Furthermore, reactance theory suggests that policy makers should aim to bundle the policy in a comprehensive mobility reform, focusing not only on road pricing, which may be perceived as limiting options, but also include option-increasing measures.

6.5 Future Research

A variety of interesting avenues for future research emerges from this thesis. Differences in how people deal with change on a societal level have rarely been more easily observed than under the current circumstances. Reactance can be an interesting theoretical approach to explaining more political and societal phenomenons than attitudes towards road pricing.

In the case of introducing policy, such as road pricing, it would be beneficial to observe if, how and why the determinants of acceptability change over time.

Single observations in time should further explore the resoluteness with which some rejected proposed policy reforms that emerged from the close inspection of voting behavior in the choice experiment.

6.6 Chapter Summary

The question posed in the beginning of this thesis, "[w]hy is the world reluctant to do the obvious" (Lave, 1995, p. 465), continues to be valid.

For the case of road pricing in the form of a vehicle mileage tax, however, it can be concluded that fears of immense public opposition towards a vehicle mileage tax in Sweden do not need to be upheld as potential answers.

The framing experiment revealed an overwhelming neutrality towards the proposal of introducing such a policy reform and the choice experiment even revealed that proposals including a vehicle mileage tax component are preferred over keeping only fuel taxes.

Fairness and reactance arousal are important mediators of the acceptability of a vehicle mileage tax, but given reasonable tax levels, proper explanation of reasons for, workings and outcomes of a vehicle mileage tax, they could perhaps even be used to smooth the introduction of a novel vehicle mileage tax.

References

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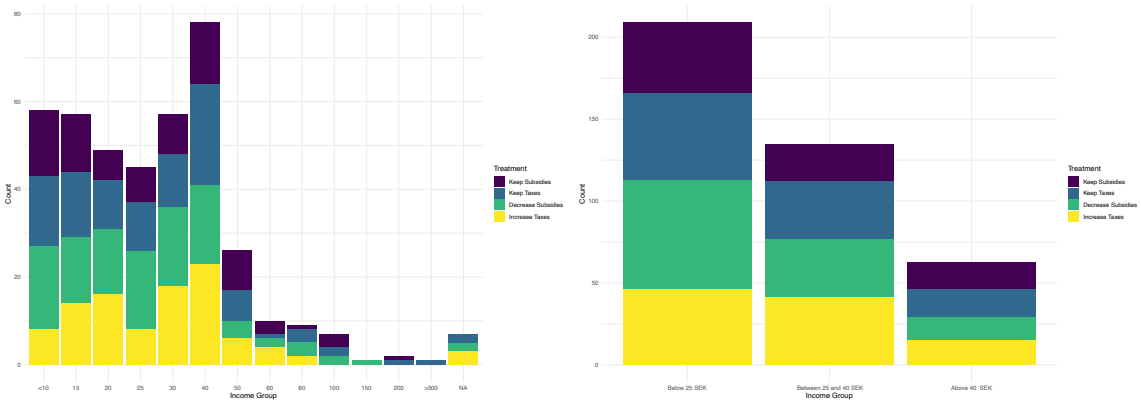
Appendix A

(Appendix Data)

A.1 Additional Graphs

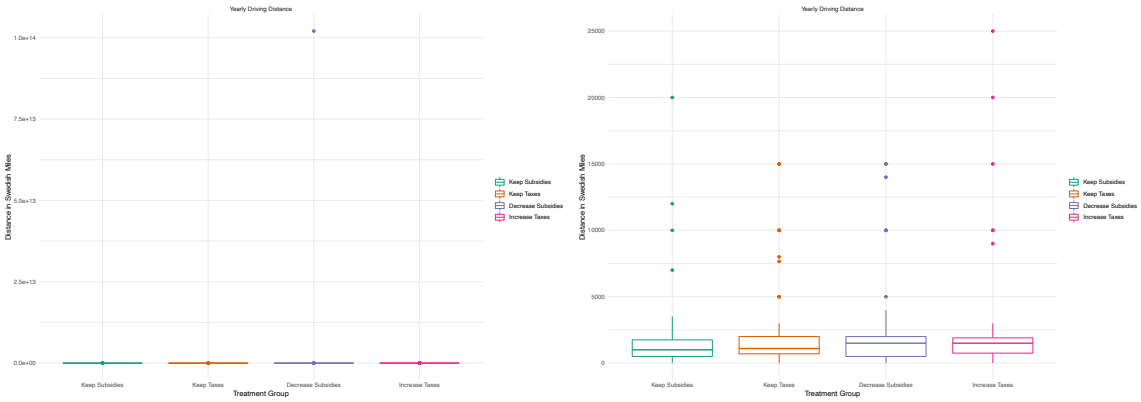
Income Distribution



(a) Histogram of All Income Groups *(b) Histogram of Rebinned Income Groups*

Figure A.1: Histograms of Income in Thousands of SEK by Treatment Group

Driving Distance Distribution



(a) Including Outliers *(b) Including Outliers over 400.000 km / year*

Figure A.2: Boxplot of Driving Distance by Treatment Group

Environmental Concern Distribution

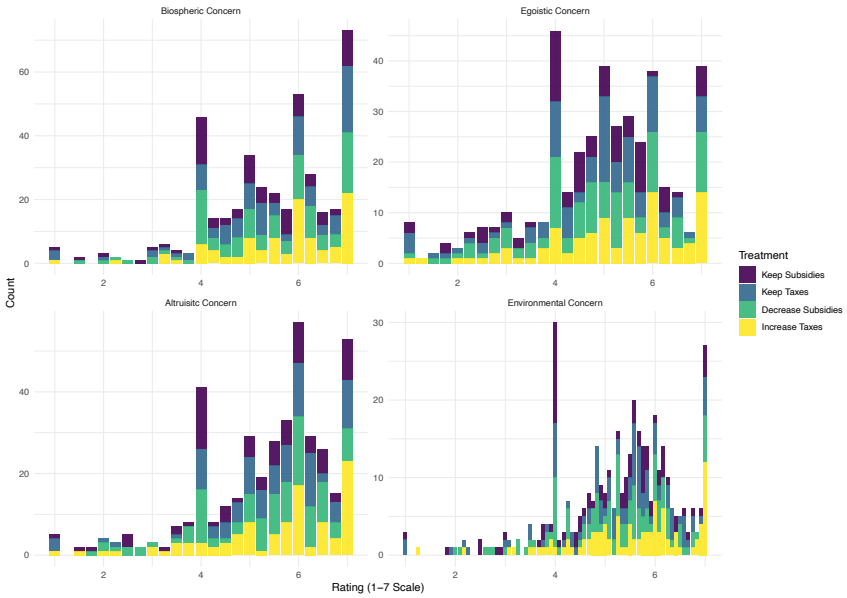


Figure A.3: Environmental Concern Scale and Sub-scales

Appendix B

(Appendix Methods)

B.1 Questionnaire

Text in red was only visible to the survey company as instructions for setting up the online survey. Participants only saw one treatment and only one block of choice sets, depending on the group they were randomized to.

B.1.1 English Questionnaire

Survey About Vehicle Taxes in Sweden

We appreciate that you have taken your time to participate in this research study. This is a survey about vehicle taxes in Sweden. The responses to this survey might influence the transport policy and car market in the future in Sweden.

The research study is conducted by a research team at IVL, the Swedish Environmental Research Institute and the department of Economic History at Lund University. The research is funded by the state-owned Swedish Foundation for Strategic Environmental Research (Mistra).

You have been asked to participate in this study because your opinion as a citizen matters for public decisions. After some initial questions about your opinion on vehicle taxes, you will be faced with 6 choice situations, where policy proposals are described. You will be asked which policy proposal that you are most willing to accept. This is followed by some background questions. The questionnaire will take approximately 20 minutes to reply.

Your contribution is important and cannot be replaced by anyone else's. All answers will be treated completely anonymously. Your answers will be decoded and made anonymous and the results will only be presented on an aggregated level without the ability to link your response to you.

For any questions about the survey, please contact Magnus Hennlock 010-788 69 08 magnus.hennlock@ivl.se

The questionnaire must be answered **no later than 2020-XX-XX**. The survey

is automatically saved when you click Next.

You can close the window and continue later.

The following text is a summary of a report by the Swedish authority Transport Analysis.*[1] *Please carefully read the summary.

Cars are among the most heavily taxed or regulated consumer products in the society. This can be explained by the fact that few consumer products require such a large public infrastructure with road and bridge maintenance, new construction, and administration. Diesel and petrol cars are also a one of the largest sources of greenhouse gas emissions in Sweden.

The largest social costs of traffic relate to local air pollution, noise, traffic congestion and traffic accidents. Consequences include worse health, injuries and lower quality of life. Due to higher population density in cities, the social costs for accidents, noise and local air pollution can be 7 to 9 times larger in large cities than in rural areas.

To cover funding for public infrastructure and traffic-related social costs, fuel taxes, annual vehicles taxes and other taxes are collected from vehicles. To prevent "fuel tourism" between different regions, the fuel tax rates are the same across the country. As a result, an average car pays more taxes than it causes social costs per kilometre in rural areas, while paying less taxes than caused costs per kilometre in large cities. Driving in cities is therefore subsidized.

Fossil fuels are being phased out and more and more cars are being fully or partially electric. Cars with electric driving cause lower social costs while driving since they do not contribute to greenhouse gases and local air pollution. Still they cause accidents, local air pollution (particles from tires), noise (tires) and road wear. Since they do not pay transport taxes, cars with electric driving pay less in taxes than the costs per kilometre that they cause to society. Driving for instance electric cars is therefore subsidized.

Proposal of a road policy reform in Sweden

You will now read a proposal of a policy reform addressing the situation described above.

Afterwards you will be asked some questions about the proposal.

Subjects should be randomized between the 4 text treatments T1-T4 below.

[1] Rapport 2018:15 Trafikanalys

Treatment T1 (Keep Subsiding)

Proposal for keeping the subsidies until 2030:

Keep current subsidies for petrol and diesel cars in large cities until 2030.

Keep current subsidies for cars with electric driving until 2030.

Afterwards, shift to a mileage tax, a tax paid per mile, where the mileage instead of the fuel is taxed. The level of the mileage tax is higher in large cities than in rural areas. In turn, fuel taxes are reduced. Cars with electric driving are subject to lower level charges per mile than petrol and diesel cars. The location of driving can be identified with a technology not storing personal information.

Treatment T2 (Keep Taxing)

Proposal for keeping the taxes until 2030:

Keep current taxes for petrol and diesel cars in large cities until 2030.

Keep current taxes for cars with electric driving until 2030.

Afterwards, shift to a mileage tax, a tax paid per mile, where the mileage instead of the fuel is taxed. The level of the mileage tax is higher in large cities than in rural areas. The location of driving can be identified with a technology not storing personal information. In turn, fuel taxes are reduced. Cars with electric driving are subject to lower level charges per mile than petrol and diesel cars.

Treatment T3 (Reduce Subsidising)

Proposal for decreasing the subsidies in 2030:

Reduce subsidies for petrol and diesel cars in large cities in 2030.

Reduce subsidies for cars with electric driving in 2030.

Afterwards, shift to a mileage tax, a tax paid per mile, where the mileage instead of the fuel is taxed. The level of the mileage tax is higher in large cities than in rural areas. The location of driving can be identified with a technology not storing personal information. In turn, fuel taxes are reduced. Cars with electric driving are subject to lower level charges per mile than petrol and diesel cars.

Treatment T4 (Increase Taxing)

Proposal for increasing the taxes in 2030:

Increase taxes for petrol and diesel cars in large cities in 2030.

Increase taxes for cars with electric driving in 2030.

Afterwards, shift to a mileage tax, a tax paid per mile, where the mileage instead of the fuel is taxed. The level of the mileage tax is higher in large cities than in rural areas. The location of driving can be identified with a technology not storing personal information. In turn, fuel taxes are reduced. Cars with electric driving are subject to lower level charges per mile than petrol and diesel cars.

Questions about the proposal

Subjects from all treatments T1-T4 face the questions below

We ask you to consider the message above and answer two sets of questions about the proposal and the way the proposal was presented:

Questions about the proposal

1. Do you support the introduction of a mileage tax? { *Strongly disagree, Disagree, Somewhat Disagree, Neither agree or disagree, Somewhat Agree, Agree, Strongly agree*}

2. Are you willing to accept the introduction of a mileage tax? { *Strongly disagree, Disagree, Somewhat Disagree, Neither agree or disagree, Somewhat Agree, Agree, Strongly agree*}

3. I find a mileage tax...
   { *very unfair, unfair, somewhat unfair, neutral, somewhat fair, very fair* }

Questions regarding the presentation of the proposal

Randomize the order of 4)-13)

4. The message threatened my freedom to choose. { *Strongly disagree, Disagree, Somewhat Disagree, Neither agree or disagree, Somewhat Agree, Agree, Strongly agree*}

5. The message tried to make a decision for me.
{ *Strongly disagree, Disagree, Somewhat Disagree, Neither agree or disagree, Somewhat Agree, Agree, Strongly agree*}

6. The message tried to tried to manipulate me.
{ *Strongly disagree, Disagree, Somewhat Disagree, Neither agree or disagree, Somewhat Agree, Agree, Strongly agree*}

7. This message made me angry.
{ *Strongly disagree, Disagree, Somewhat Disagree, Neither agree or disagree, Somewhat Agree, Agree, Strongly agree*}

8. This message irritated me.
{ *Strongly disagree, Disagree, Somewhat Disagree, Neither agree or disagree, Somewhat Agree, Agree, Strongly agree*}

9. This message made me annoyed.
{ *Strongly disagree, Disagree, Somewhat Disagree, Neither agree or disagree, Somewhat Agree, Agree, Strongly agree*}

10. I found myself looking for flaws in the way the information was presented in the message.
{ *Strongly disagree, Disagree, Somewhat Disagree, Neither agree or disagree, Somewhat Agree, Agree, Strongly agree*}

11. I couldn't help but to think about ways that the information being presented was inaccurate or misleading.
{ *Strongly disagree, Disagree, Somewhat Disagree, Neither agree or disagree, Somewhat Agree, Agree, Strongly agree*}

12. I found myself thinking of ways I disagreed with what was being presented. { *Strongly disagree, Disagree, Somewhat Disagree, Neither agree or disagree, Somewhat Agree, Agree, Strongly agree*}

13. I felt like I wanted to 'argue back' to what was going on in the message.
{ *Strongly disagree, Disagree, Somewhat Disagree, Neither agree or disagree, Somewhat Agree, Agree, Strongly agree*}

The previous text treatments T1-T4 are repeated to each treatment group. That means that, treatment group T1 again faces the same text treatment T1 etc.

Please read the proposal of the policy reform again below. Afterwards you will be asked to compare different policy proposals and which of them you are most willing to accept.

Treatment T1 (Keep Subsiding)

Proposal for keeping the subsidies until 2030:

Keep current subsidies for petrol and diesel cars in large cities until 2030.

Keep current subsidies for cars with electric driving until 2030.

Afterwards, shift to a mileage tax, a tax paid per mile, where the mileage instead of the fuel is taxed. The level of the mileage tax is higher in large cities than in rural areas. In turn, fuel taxes are reduced. Cars with electric driving are subject to lower level charges per mile than petrol and diesel cars. The location of driving can be identified with a technology not storing personal information.

Treatment T2 (Keep Taxing)

Proposal for keeping the taxes until 2030:

Keep current taxes for petrol and diesel cars in large cities until 2030.

Keep current taxes for cars with electric driving until 2030.

Afterwards, shift to a mileage tax, a tax paid per mile, where the mileage instead of the fuel is taxed. The level of the mileage tax is higher in large cities than in rural areas. The location of driving can be identified with a technology not storing personal information. In turn, fuel taxes are reduced. Cars with electric driving are subject to lower level charges per mile than petrol and diesel cars.

Treatment T3 (Reduce Subsidising)

Proposal for decreasing the subsidies in 2030:

Reduce subsidies for petrol and diesel cars in large cities in 2030.

Reduce subsidies for cars with electric driving in 2030.

Afterwards, shift to a mileage tax, a tax paid per mile, where the mileage instead of the fuel is taxed. The level of the mileage tax is higher in large cities than in rural areas. The location of driving can be identified with a technology not storing personal information. In turn, fuel taxes are reduced. Cars with electric driving are subject to lower level charges per mile than petrol and diesel cars.

Treatment T4 (Increase Taxing)

Proposal for increasing the taxes in 2030:

Increase taxes for petrol and diesel cars in large cities in 2030.

Increase taxes for cars with electric driving in 2030.

Afterwards, shift to a mileage tax, a tax paid per mile, where the mileage instead of the fuel is taxed. The level of the mileage tax is higher in large cities than in rural areas. The location of driving can be identified with a technology not storing personal information. In turn, fuel taxes are reduced. Cars with electric driving are subject to lower level charges per mile than petrol and diesel cars.

Treatment ends here. All subjects get the same text below.

Task:

Consider the policy tax reform described above and answer below which policy proposal you are most willing to accept. You will make in total 6 choices following each other. In each choice you are presented with two policy proposals besides the current policy. The proposals imply that the total tax payment per kilometre will be lower in rural areas and higher in large cities. In some proposals, a mileage tax is imposed on electric cars only as diesel and petrol cars are expected to be replaced by electric cars in the future.

In the next pages, it is important to choose the alternative that you are most

willing to accept. Please answer as truthfully as possible. Please, read the questions and choice situations in the following pages carefully.

Instructions to survey company

- 12 choice sets in total that are separated in two blocks, 1 and 2, each with 6 choice sets
- All subjects, regardless of previous treatment, are randomized between block 1 and 2 below.

BLOCK 1 (Choice sets 1-6)

Randomize the order of choice sets 1-6 below

Choice set 1

Please tick the box for the alternative that you are most willing to accept.

Table B.1: Choice Set

	Mileage and Fuel Tax After 2030 Proposal 1	**Mileage and Fuel Tax After 2030 Proposal 2**	**Only Fuel Tax Without Mileage Tax After 2030**
Fuel taxes	3 SEK/litre	6 SEK/litre	6 SEK/litre
Mileage tax in cities			
Electric cars	4 SEK/mil	2 SEK/mil	No mileage tax
Diesel and petrol cars	5 SEK/mil	5 SEK/mil	No mileage tax
Mileage tax in highways and rural areas			
Electric cars	2 SEK/mil	No mileage tax	No mileage tax
Diesel and petrol cars	1 SEK/mil	No mileage tax	No mileage tax
I am most willing to accept	□	□	□
Of the proposals, I am most willing to accept*	□	□	

* The last question was only shown to participants if their primary choice was the current policy.
Their primary choice was recorded and participants were unable to retroactively change their first decision.

Only one option can be chosen

Restrict unrealistic combinations such as no mileage tax and reduction in fuel taxes.

Choice set 2

Choice set 3

Choice set 4

Choice set 5

Choice set 6

BLOCK 2 (Choice sets 7-12)

Randomize the order of choice sets 7-12 below

Choice set 7

Choice set 8

Choice set 9

Choice set 10

Choice set 11

Choice set 12

All subjects get the same questions of the remaining survey.

Opinions about traffic-related impacts, costs and mileage tax

In this section we will ask you about your opinions about traffic-related impacts, costs and mileage taxes.

14. The total tax payments from traffic, compared to the total social costs from traffic, is currently: { *Much smaller, Smaller, Somewhat smaller, About the same, Somewhat larger, Larger, Much larger*}

15. To what extent do you agree that the following issues are a problem within cities?
    (a) Road congestion { *Strongly disagree, Disagree, Somewhat Disagree, Neither agree or disagree, Somewhat Agree, Agree, Strongly agree*}
    (b) Noise { *Strongly disagree, Disagree, Neutral, Agree, Strongly agree*}
    (c) Air pollution
    { *Strongly disagree, Disagree, Somewhat Disagree, Neither agree or disagree, Somewhat Agree, Agree, Strongly agree*}
    (d) Traffic accidents { *Strongly disagree, Disagree, Somewhat Disagree, Neither agree or disagree, Somewhat Agree, Agree, Strongly agree*}
    (e) Travelling costs
    { *Strongly disagree, Disagree, Somewhat Disagree, Neither agree or disagree, Somewhat Agree, Agree, Strongly agree*}
    (f) Parking { *Strongly disagree, Disagree, Somewhat Disagree, Neither agree or disagree, Somewhat Agree, Agree, Strongly agree*}

16. To what extent do you agree that the following issues are a problem within rural areas?
    (a) Road congestion { *Strongly disagree, Disagree, Somewhat Disagree, Neither agree or disagree, Somewhat Agree, Agree, Strongly agree*}
    (b) Noise
    { *Strongly disagree, Disagree, Neutral, Agree, Strongly agree*}
    (c) Air pollution
    { *Strongly disagree, Disagree, Somewhat Disagree, Neither agree or disagree, Somewhat Agree, Agree, Strongly agree*}
    (d) Traffic accidents { *Strongly disagree, Disagree, Somewhat Disagree, Neither agree or disagree, Somewhat Agree, Agree, Strongly agree*}
    (e) Travelling costs
    { *Strongly disagree, Disagree, Somewhat Disagree, Neither agree or disagree, Somewhat Agree, Agree, Strongly agree*}
    (f) Parking { *Strongly disagree, Disagree, Somewhat Disagree, Neither agree or disagree, Somewhat Agree, Agree, Strongly agree*}

17. It is important that the tax payments in tax reform cover traffic related infrastructure costs

    { *Strongly disagree, Disagree, Somewhat Disagree, Neither agree or disagree, Somewhat Agree, Agree, Strongly agree*}

18. It is important that the tax payments in tax reform cover traffic related environmental and health costs

    { *Strongly disagree, Disagree, Somewhat Disagree, Neither agree or disagree, Somewhat Agree, Agree, Strongly agree*}

19. Introducing a mileage tax for electric vehicles only is relevant if diesel and petrol cars are replaced by electric cars in the future

    { *Strongly disagree, Disagree, Somewhat Disagree, Neither agree or disagree, Somewhat Agree, Agree, Strongly agree*}

20. To what extent do you agree that the location of driving needed for a mileage tax can be identified with a technology not storing personal information? { *Strongly disagree, Disagree, Somewhat Disagree, Neither agree or disagree, Somewhat Agree, Agree, Strongly agree*}

21. Would you like to add anything about mileage tax? { *open string input*}

Car ownership

22. Do you have a driving license? { *Yes/No*}

23. Do you plan to get a driving license in the next few years? { *Yes/No*}

24. Do you own or have access to a car? { *Yes/No*}

    [If answer to 23) is yes then 24) otherwise jump to 34)]

25. Describe the car that you own or have access to?

    (a) Brand of the car { *string input*}
    (b) Model { *string input*}
    (c) Model year / year of production { *integer input between 1950 and 2019*}
    (d) Year of purchase { *integer input between 1950 and 2019*}

26. How much do you pay (in SEK) per month for the following car-related aspects?

    (a) Taxes (per month) { *integer input*}
    (b) Insurance (per month) { *integer input*}
    (c) Maintenance (per month) { *integer input*}
    (d) Parking at home (per month) { *integer input*}

(e) Congestion charge (per month) { *integer input*}

(f) Value loss { *integer input*}

27. How long distance in Swedish miles do you drive per year with the car that you have access to? { *integer input*}

28. Does the car use one or more fuels? { *One fuel, several fuels*}

29. Which fuel does the car use (up to two alternatives can be specified)

    (a) Gasoline

    (b) Diesel

    (c) E85

    (d) Ethanol

    (e) Electricity

    (f) Gas (e.g. natural gas, biogas, LPG)

    (g) Other fuel, which / which fuel is it?

30. What is the average fuel consumption of your car (litres/mil) { *integer input*} . An estimation is better than no answer.

Travels between your home and work

31. How many trips did you do to work in February this year? An approximate estimate is better than none at all.

    Number { *integer input*}

32. Which mode of travel did you mainly use during these trips?

    (a) Walk

    (b) Bike

    (c) Moped

    (d) MC

(e) Public transport

(f) Passenger car, driver

(g) Passenger car, passenger

(h) Other, specify

33. How often did you drive a car (as driver or passenger) between home and work in February this year?

(a) 5-7 days a week (daily or almost every day)

(b) 2-4 days per week (a few days a week)

(c) 1 day a week (one day a week)

(d) 1-3 days a month (one or a few days a month)

(e) More rarely

(f) Never

34. How often did you travel by public transport between home and work in February this year?

(a) 5-7 days a week (daily or almost every day)

(b) 2-4 days per week (a few days a week)

(c) 1 day a week (one day a week)

(d) 1-3 days a month (one or a few days a month)

(e) More rarely

(f) Never

Private travels

35. How often did you make private trips other than travelling between home and work in February this year?

(a) 5-7 days a week (daily or almost every day)

(b) 2-4 days per week (a few days a week)

(c) 1 day a week (one day a week)
(d) 1-3 days a month (one or a few days a month)
(e) More rarely
(f) Never

36. Which mode of travel did you mainly use during these trips?

(a) Walk
(b) Bike
(c) Moped
(d) MC
(e) Public transport
(f) Passenger car, driver
(g) Passenger car, passenger
(h) Other, specify

37. How often did you drive a car (as driver or passenger) in February this year?

(a) 5-7 days a week (daily or almost every day)
(b) 2-4 days per week (a few days a week)
(c) 1 day a week (one day a week)
(d) 1-3 days a month (one or a few days a month)
(e) More rarely
(f) Never

38. How often did you travel by public transport in February this year?

(a) 5-7 days a week (daily or almost every day)
(b) 2-4 days per week (a few days a week)
(c) 1 day a week (one day a week)
(d) 1-3 days a month (one or a few days a month)
(e) More rarely
(f) Never

Income

39. What was your monthly income (before taxes) in February this year? (the information is only for statistical purposes and is gathered anonymously)

- Mellan 50 000 och 100 000
- Mellan 100 000 och 150 000
- Mellan 150 000 och 200 000
- Mellan 200 000 och 250 000
- Mellan 250 000 och 300 000
- Mellan 300 000 och 400 000
- Mellan 400 000 och 500 000
- Mellan 500 000 och 600 000
- Mellan 600 000 och 800 000
- Mellan 800 000 och 1 000 000
- Mellan 1 000 000 och 1 500 000
- Mellan 1 500 000 och 2 000 000
- Mellan 2 000 000 och 3 000 000
- Över 3 000 000

Environmental concern

People around the world are generally concerned about environmental problems because of the consequences that result from harming nature. However, people differ in the consequences that concern them the most.

40. Please rate each of the following items from 1 (*Not at all important*) to 7 (*Extremely important*) in response to the question:

I am concerned about environmental problems because of the consequences for:

Randomize the order of 1-12

(a) Plants

(b) Me
(c) Animals
(d) People in my country
(e) Marine life
(f) Future generations
(g) My lifestyle
(h) All people
(i) Birds
(j) My health
(k) Children
(l) My future

Inputs to each of 1-12 above { *Not at all important, Low importance, Slightly important, Neutral, Moderately important, Very important, Extremely important*}

General

41. What is your gender? { *male/female*}
42. What is your age? { *integer input*}
43. What is your status? { *single, married, sambo*}
44. How many children do you have that lives in the household? { *integer input*}
45. What were your main occupation in February this year?

    (a) Self-employed
    (b) Employee, full time
    (c) Employee, part time
    (d) Works in own household (also care of adult relatives, 100% parental leave)
    (e) Retired (including sickness benefit, activity allowance, 100% long-term sick leave, 100% sickness benefit, early retirement)
    (f) Studying
    (g) Unemployed
    (h) In labor market measures (not studies)
    (i) Other employment

46. Do you live in a single-family or a multi-family home?

    (a) Single-family or two-family house (villa, townhouse, chain house)
    (b) Apartment block
    (c) Other specify what____

Feedback

47. Would you like to add anything about how the survey was designed { *open string input*}

B.1.2 Swedish Questionnaire

Enkät om vägbeskattning i Sverige

Vi uppskattar att du har tagit dig tid att delta i denna forskningsstudie. Detta är en undersökning om vägbeskattningen i Sverige. Svaren på undersökningen kan påverka transportpolitiken och bilmarknaden i framtiden i Sverige.

Forskningsstudien genomförs av forskare vid IVL, Svenska Miljöinstitutet samt Intuitionen för Ekonomisk Historia vid Lunds Universitet. Forskningen finansieras av den statliga svenska stiftelsen för strategisk miljöforskning (Mistra).

Du har blivit ombedd att delta i den här studien eftersom din åsikt som medborgare är viktig för politiska beslut. Efter några inledande frågor kring dina åsikter om vägbeskattning kommer du att få 6 valsituationer där olika politiska förslag beskrivs. Du blir sedan tillfrågad vilka förslag du är mest villig att acceptera. Detta följs av ett antal bakgrundsfrågor. Enkäten tar cirka 20 minuter att besvara.

Dina svar är viktiga och kan inte ersättas av någon annans. Alla svar behandlas anonymt. Dina svar kommer att avkodas och anonymiseras och resultaten kommer endast att presenteras på en aggregerad nivå utan möjlighet att koppla dina svar till dig.

För frågor om undersökningen, vänligen kontakta Magnus Hennlock 010-788 69 08 magnus.hennlock@ivl.se

Enkäten ska besvaras senast 2020-XX-XX. Enkäten med de svar du angivit sparas automatiskt när du klickar på Nästa.

Du kan närsomhelst stänga fönstret och fortsätta enkäten senare.

Nedanstående text är en sammanfattning av en rapport från den svenska myndigheten Trafikanalys[2]. Var vänlig läs sammanfattningen noga.

Personbilar är bland de högst beskattade konsumentprodukterna i samhället. Det kan dels förklaras av att få konsumentprodukter kräver en så stor offentlig infrastruktur vilken i sin tur kräver administration, nybyggnation och underhåll av det nationella vägnätet. Diesel- och bensinbilar är dessutom en av de största källorna till växthusgasutsläpp i Sverige.

De största samhällskostnaderna från trafik är dock påverkan av lokala luftföroreningar, buller, trängsel och trafikolyckor. Konsekvenserna inkluderar personskador, försämrad hälsa och lägre livskvalitet. På grund av högre befolkningstäthet i städer kan samhällets kostnader för olyckor, buller och lokala luftföroreningar vara 7 till 9 gånger högre i större städer jämfört på landsbygden.

För att täcka finansieringen av väginfrastruktur och trafikrelaterade samhällsekonomiska kostnader tas bränsleskatter, årliga fordonsskatter och andra skatter ut från fordon. För att förhindra ” bränsleturism” mellan olika delar av landet är bränsleskatterna lika stora över hela landet.

Detta innebär att en genomsnittlig bil på landsbygden betalar mer i skatter än de kostnader per kilometer som den orsakar samhället. I större städer betalar en genomsnittlig bil mindre i skatter än de kostnader per kilometer som den orsakar samhället. Bilkörning i städer kan därför sägas vara subventionerat av samhället.

Fossila bränslen kommer att fasas ut och allt fler bilar drivs helt eller delvis på el. Bilar med eldrift orsakar lägre samhällsekonomiska kostnader under körning eftersom de inte bidrar till växthusgaser eller lokala luftföroreningar i samma utsträckning. Fortfarande orsakar de dock trafikolyckor, lokala luftföroreningar (partiklar från däck), buller (från rullande däck) och vägslitage. Eftersom fordonskatter inte tas ut från bilar med eldrift, betalar t.ex. elbilar mindre i skatter än de kostnader per kilometer som de orsakar samhället. Körning med elbil kan därför sägas vara subventionerat av samhället.

Förslag till vägskattereform i Sverige

Du kommer nu att få läsa ett förslag till en vägskattereform för den situation som beskrivs ovan. Efteråt kommer du att få svara på ett antal frågor om förslaget.

Subjekten ska randomiseras mellan de fyra textbehandlingarna T1-T4 nedan.

Behandling T1

[2]Rapport 2018:15 Trafikanalys

Förslag om att behålla nuvarande subventioneringar fram till 2030:

Behåll nuvarande subventionering av bensin- och dieselbilar i större städer fram till 2030.

Behåll nuvarande subventionering av bilar med eldrift fram till 2030.

Inför därefter en milskatt, alltså en skatt per mil, där körsträckan istället för bränslet beskattas. Milskatten är högre i större städer än på landsbygden. Som kompensation sänks bränsleskatten. Bilar med eldrift beskattas med lägre milskatt jämfört bensin- och dieselbilar. Var bilen körs kan identifieras med en teknik som inte lagrar någon personlig information i längden.

Behandling T2

Förslag om att behålla nuvarande beskattning fram till 2030:

Behåll nuvarande beskattning av bensin- och dieselbilar i stora städer fram till 2030.

Behåll nuvarande beskattning av bilar med eldrift fram till 2030.

Inför därefter en milskatt, alltså en skatt per mil, där körsträckan istället för bränslet beskattas. Milskatten är högre i större städer än på landsbygden. Som kompensation sänks bränsleskatten. Bilar med eldrift beskattas med lägre milskatt jämfört bensin- och dieselbilar. Var bilen körs kan identifieras med en teknik som inte lagrar någon personlig information i längden.

Behandling T3

Förslag om minskad subventionering 2030:

Minskad subventionering av bensin- och dieselbilar i stora städer 2030.

Minskad subventionering av bilar med eldrift 2030.

Inför därefter en milskatt, alltså en skatt per mil, där körsträckan istället för bränslet beskattas. Milskatten är högre i större städer än på landsbygden. Som kompensation sänks bränsleskatten. Bilar med eldrift beskattas med lägre milskatt jämfört bensin- och dieselbilar. Var bilen körs kan identifieras med en teknik som inte lagrar någon personlig information i längden.

Behandling T4

Förslag om höjd beskattning 2030:

Höjd beskattning av bensin- och dieselbilar i stora städer 2030.

Höjd beskattning av bilar med eldrift 2030.

Inför därefter en milskatt, alltså en skatt per mil, där körsträckan istället för bränslet beskattas. Milskatten är högre i större städer än på landsbygden. Som kompensation sänks bränsleskatten. Bilar med eldrift beskattas med lägre milskatt jämfört bensin- och dieselbilar. Var bilen körs kan identifieras med en teknik som inte lagrar någon personlig information i längden.

:

Frågor om förslaget

Subjekten från alla behandlingar T1-T4 får samma frågor nedan

Vi ber dig läsa förslaget ovan och svara på frågorna nedan om förslaget och om hur förslaget presenterades.

Frågor om förslaget

1. Stödjer du att en milskatt införs? { *Håller inte alls med, Håller inte med, Håller delvis inte med, Håller varken med eller inte med, Håller delvis med, Håller med, Håller fullständigt med*}

2. Skulle du kunna acceptera att en milskatt införs? { *Håller inte alls med, Håller inte med, Håller delvis inte med, Håller varken med eller inte med, Håller delvis med, Håller med, Håller fullständigt med*}

3. Jag anser att en milskatt är... { *väldigt orättvis, orättvis, något orättvis, neutral, något rättvis, mycket rättvis*}

Frågor om hur förslaget presenterades i budskapet

Randomisera ordningen på 4) – l3) nedan

4. Budskapet hotade min frihet att välja. { *Håller inte alls med, Håller inte med, Håller delvis inte med, Håller varken med eller inte med, Håller delvis med, Håller med, Håller fullständigt med*}

5. Budskapet försökte fatta ett beslut åt mig. { *Håller inte alls med, Håller inte med, Håller delvis inte med, Håller varken med eller inte med, Håller delvis med, Håller med, Håller fullständigt med*}

6. Budskapet försökte manipulera mig. { *Håller inte alls med, Håller inte med, Håller delvis inte med, Håller varken med eller inte med, Håller delvis med, Håller med, Håller fullständigt med*}

7. Det här budskapet gjorde mig arg. { *Håller inte alls med, Håller inte med, Håller delvis inte med, Håller varken med eller inte med, Håller delvis med, Håller med, Håller fullständigt med*}

8. Det här budskapet irriterade mig. { *Håller inte alls med, Håller inte med, Håller delvis inte med, Håller varken med eller inte med, Håller delvis med, Håller med, Håller fullständigt med*}

9. Det här budskapet gjorde mig förargad. { *Håller inte alls med, Håller inte med, Håller delvis inte med, Håller varken med eller inte med, Håller delvis med, Håller med, Håller fullständigt med*}

10. Jag insåg att jag letade efter brister hos det sätt som informationen presenterades i budskapet. { *Håller inte alls med, Håller inte med, Håller delvis inte med, Håller varken med eller inte med, Håller delvis med, Håller med, Håller fullständigt med*}

11. Jag kunde inte låta bli att tänka på vilka sätt som den information som presenterades var felaktig eller vilseledande. { *Håller inte alls med, Håller inte med, Håller delvis inte med, Håller varken med eller inte med, Håller delvis med, Håller med, Håller fullständigt med*}

12. Jag insåg att jag tänkte på varför jag inte håller med om vad som presenterades. { *Håller inte alls med, Håller inte med, Håller delvis inte med, Håller varken med eller inte med, Håller delvis med, Håller med, Håller fullständigt med*}

13. Jag kände att jag ville "argumentera mot" det som fanns i budskapet. { *Håller inte alls med, Håller inte med, Håller delvis inte med, Håller varken med eller inte med, Håller delvis med, Håller med, Håller fullständigt med*}

De tidigare textbehandlingarna T1-T4 repeteras här till varje behandlingsgrupp. Det betyder att behandlingsgrupp T1 igen får samma textbehandling T1 etc.

Läs förslaget till vägskattereform igen nedan. Efteråt blir du ombedd att jämföra olika varianter av vägskattereformen och ange vilka av dem som du är mest villig att acceptera.

Behandling T1

Förslag om att behålla nuvarande subventioneringar fram till 2030:

Behåll nuvarande subventionering av bensin- och dieselbilar i större städer fram till 2030.

Behåll nuvarande subventionering av bilar med eldrift fram till 2030.

Inför därefter en milskatt, alltså en skatt per mil, där körsträckan istället för bränslet beskattas. Milskatten är högre i större städer än på landsbygden. Som kompensation sänks bränsleskatten. Bilar med eldrift beskattas med lägre milskatt jämfört bensin- och dieselbilar. Var bilen körs kan identifieras med en teknik som inte lagrar någon personlig information i längden.

Behandling T2

Förslag om att behålla nuvarande beskattning fram till 2030:

Behåll nuvarande beskattning av bensin- och dieselbilar i stora städer fram till 2030.

Behåll nuvarande beskattning av bilar med eldrift fram till 2030.

Inför därefter en milskatt, alltså en skatt per mil, där körsträckan istället för bränslet beskattas. Milskatten är högre i större städer än på landsbygden. Som kompensation sänks bränsleskatten. Bilar med eldrift beskattas med lägre milskatt jämfört bensin- och dieselbilar. Var bilen körs kan identifieras med en teknik som inte lagrar någon personlig information i längden.

Behandling T3

Förslag om minskad subventionering 2030:

Minskad subventionering av bensin- och dieselbilar i stora städer 2030.

Minskad subventionering av bilar med eldrift 2030.

Inför därefter en milskatt, alltså en skatt per mil, där körsträckan istället för bränslet beskattas. Milskatten är högre i större städer än på landsbygden. Som kompensation sänks bränsleskatten. Bilar med eldrift beskattas med lägre milskatt jämfört bensin- och dieselbilar. Var bilen körs kan identifieras med en teknik som inte lagrar någon personlig information i längden.

Behandling T4

Förslag om höjd beskattning 2030:

Höjd beskattning av bensin- och dieselbilar i stora städer 2030.

Höjd beskattning av bilar med eldrift 2030.

Inför därefter en milskatt, alltså en skatt per mil, där körsträckan istället för bränslet beskattas. Milskatten är högre i större städer än på landsbygden. Som kompensation sänks bränsleskatten. Bilar med eldrift beskattas med lägre milskatt jämfört bensin- och dieselbilar. Var bilen körs kan identifieras med en teknik som inte lagrar någon personlig information i längden.

Behandling avslutas här. Alla subjekt får samma text nedan

Uppgift:

Du ska nu utgå från den vägskattereform som beskrivs ovan och väja de varianter av reformen du är mest villig att acceptera. Du kommer att få göra sammanlagt 6 val efter varandra. I varje val får du ta ställning till två olika förslag vid sidan om dagens beskattning. Förslagen innebär att den totala skattebetalningen per kilometer blir lägre på landsbygden och högre i större städer jämfört dagens beskattning. I vissa av förslagen införs milskatt enbart på elbilar eftersom bensin- och diesel- och bensinbilar förväntas försvinna i framtiden när de ersätts av elbilar.

På kommande sidor är det viktigt att du väljer det alternativ som du är mest villig att acceptera. Vänligen, läs frågorna och informationen på följande sidor noga. Svara så sanningsenligt som du kan.

Instruktioner till Enkätfabriken

Totalt 12 choice sets som är uppdelade mellan två block, 1 och 2, vardera med 6 choice sets

Alla subjekt, oavsett tidigare behandling, randomiseras mellan block 1 och 2 nedan.

BLOCK 1 (Choice sets 1-6)

Randomisera ordningen hos choice sets 1-6 nedan

Choice set 1

Markera i rutan under det alternativ som du är mest villig att acceptera. Endast ett alternativ kan väljas

Endast ett alternativ kan väljas

Begränsa orealistiska kombinationer såsom ingen milskatt och minskning av bränsleskatter.

	Milskatt och bränsleskatt efter 2030 Förslag 1	Milskatt och bränsleskatt efter 2030 Förslag 2	Endast bränsleskatt utan milskatt efter 2030
Bränsleskatt	6 kr/liter	6 kr/liter	6 kr/liter
I större städer			
Milskatt för elbilar	4 kr/mil	1 kr/mil	Ingen milskatt
Milskatt för bensin- och dieselbilar	2 kr/mil	Ingen milskatt	Ingen milskatt
På landsbygden			
Milskatt för elbilar	Ingen milskatt	1 kr/mil	Ingen milskatt
Milskatt för bensin- och dieselbilar	1 kr/mil	Ingen milskatt	Ingen milskatt
Jag är mest villig att acceptera	□	□	□
Vilket av de två alternativen med milskatt är du mest villig att acceptera?			
Jag är mest villig att acceptera	□	□	

Choice set 2

Choice set 3

Choice set 4

Choice set 5

Choice set 6

BLOCK 2 (Choice sets 7-12)

Randomisera ordningen hos choice sets 7-12 nedan

Markera i rutan under det alternativ som du är mest villig att acceptera.

Endast ett alternativ kan väljas

Begränsa orealistiska kombinationer såsom ingen milskatt och minskning av bränsleskatter.

Choice set 7

Choice set 8

Choice set 9

Choice set 10

Choice set 11

Choice set 12

Frågor om trafikens påverkan, dess kostnader och om milskatt

I denna del kommer vi att fråga om dina åsikter kring trafikens påverkan, dess kostnader och om milskatt.

14. De totala skattebetalningarna från trafiken, jämfört med de totala samhällskostnaderna från trafiken, är för närvarande: { *Mycket mindre, Mindre, Något mindre, Ungefär samma, Något större, Större, Mycket större*}

15. I vilken utsträckning håller du med om att följande frågor är ett problem i större städer?

    (a) Trängsel { *Håller inte alls med, Håller inte med, Håller delvis inte med, Håller varken med eller inte med, Håller delvis med, Håller med, Håller fullständigt med*}

    (b) Buller { *Håller inte alls med, Håller inte med, Håller delvis inte med, Håller varken med eller inte med, Håller delvis med, Håller med, Håller fullständigt med*}

    (c) Lokala luftföroreningar { *Håller inte alls med, Håller inte med, Håller delvis inte med, Håller varken med eller inte med, Håller delvis med, Håller med, Håller fullständigt med*}

    (d) Trafikolyckor { *Håller inte alls med, Håller inte med, Håller delvis inte med, Håller varken med eller inte med, Håller delvis med, Håller med, Håller fullständigt med*}

    (e) Resekostnader { *Håller inte alls med, Håller inte med, Håller delvis inte med, Håller varken med eller inte med, Håller delvis med, Håller med, Håller fullständigt med*}

    (f) Parkering { *Håller inte alls med, Håller inte med, Håller delvis inte med, Håller varken med eller inte med, Håller delvis med, Håller med, Håller fullständigt med*}

16. I vilken utsträckning håller du med om att följande frågor är ett problem på landsbygden?

(a) Trängsel { *Håller inte alls med, Håller inte med, Håller delvis inte med, Håller varken med eller inte med, Håller delvis med, Håller med, Håller fullständigt med*}

(b) Buller { *Håller inte alls med, Håller inte med, Håller delvis inte med, Håller varken med eller inte med, Håller delvis med, Håller med, Håller fullständigt med*}

(c) Lokala luftföroreningar { *Håller inte alls med, Håller inte med, Håller delvis inte med, Håller varken med eller inte med, Håller delvis med, Håller med, Håller fullständigt med*}

(d) Trafikolyckor { *Håller inte alls med, Håller inte med, Håller delvis inte med, Håller varken med eller inte med, Håller delvis med, Håller med, Håller fullständigt med*}

(e) Resekostnader { *Håller inte alls med, Håller inte med, Håller delvis inte med, Håller varken med eller inte med, Håller delvis med, Håller med, Håller fullständigt med*}

(f) Parkering { *Håller inte alls med, Håller inte med, Håller delvis inte med, Håller varken med eller inte med, Håller delvis med, Håller med, Håller fullständigt med*}

17. Det är viktigt att skattebetalningarna från trafiken i en ny skattereform täcker alla kostnader för vägnätets underhåll och nybyggnation { *Håller inte alls med, Håller inte med, Håller delvis inte med, Håller varken med eller inte med, Håller delvis med, Håller med, Håller fullständigt med*}

18. Det är viktigt att skattebetalningarna från trafiken i en ny skattereform täcker de miljö- och ohälsokostnader som orsakas av trafiken. { *Håller inte alls med, Håller inte med, Håller delvis inte med, Håller varken med eller inte med, Håller delvis med, Håller med, Håller fullständigt med*}

19. Att införa en milskatt för endast elfordon är relevant om bensin- och dieselbilar ersätts av elbilar i framtiden { *Håller inte alls med, Håller inte med, Håller delvis inte med, Håller varken med eller inte med, Håller delvis med, Håller med, Håller fullständigt med*}

20. I vilken utsträckning håller du med om att det är viktigt att registreringen om var bilen körs kan göras med en teknik som inte lagrar någon personlig information i längden? { *Håller inte alls med, Håller inte med, Håller delvis inte med, Håller varken med eller inte med, Håller delvis med, Håller med, Håller fullständigt med*}

21. Vill du lägga till något om vägskatteform med milskatt? { *open string input*}

Frågor om bilägande

22. Har du körkort? { *Ja Nej*}
23. Planerar du att ta körkort under de närmaste två åren? { *Ja Nej*}
24. Äger du eller har du tillgång till bil? { *Ja Nej*}

    [Om svaret på 24) är ja så gå till 25) annars till 30)]

25. Beskriv bilen du äger eller har tillgång till:
    (a) Bilens märke { *string input*}
    (b) Modell { *string input*}
    (c) Årsmodell { *heltalsinmatning*}
    (d) År då du köpte eller fick tillgång till bilen { *heltalsinmatning*}

26. Hur mycket kostar bilen i kronor per månad? Uppskattningar är bättre än inget svar om du är osäker.

    (a) Skatter (per månad) { *heltalinmatning*}
    (b) Försäkring (per månad) { *heltalinmatning*}
    (c) Service och underhåll (per månad) { *heltalinmatning*}
    (d) Parkering hemma (per månad) { *heltalinmatning*}
    (e) Trängselskatt (per månad) { *heltalinmatning*}
    (f) Värdeminskning (per månad) { *heltalinmatning*}

27. Hur långt kör du per år med den bil du har tillgång till (mil per år)? { *heltalinmatning*}

28. Går bilen på ett eller flera bränslen? { *Ett bränsle, flera bränslen*}

29. Vilka bränslen går bilen på (upp till två alternativ kan anges)

    (a) *Bensin*

(b) *Diesel*

(c) *E85*

(d) *Etanol*

(e) *El*

(f) *Gas (t.ex. naturgas, biogas)*

(g) *Annat bränsle, vilket / vilket bränsle är det?*

30. Vad är den blandade bränsleförbrukning för bilen (liter/mil)? En uppskattning är bättre än inget svar om du är osäker. { *string input*} .

Resor mellan hemmet och arbetet

31. Hur många resor gjorde du till ditt arbete **under februari i år**? En ungefärlig uppskattning är bättre än ingen alls. { *heltalinmatning*}

32. Vilket färdsätt använde du huvudsakligen under dessa resor?

(a) *Till fots*

(b) *Cykel*

(c) *Moped*

(d) *MC*

(e) *Kollektivtrafik*

(f) *Personbil, förare*

(g) *Personbil, passagerare*

(h) *Annat, specificera*

33. Hur ofta åkte du bil (som förare eller passagerare) mellan hemmet och arbetet **under februari i år**?

(a) *5–7 dagar i veckan (dagligen eller nästan varje dag)*

(b) *2–4 dagar per vecka (några dagar i veckan)*

(c) *1 dag i veckan (en dag i veckan)*

(d) *1–3 dagar i månaden (en eller några dagar i månaden)*

(e) *Mer sällan*

(f) *Aldrig*

34. Hur ofta reste du med kollektivtrafik mellan hemmet och arbetet **under februari i år**?

(a) *5–7 dagar i veckan (dagligen eller nästan varje dag)*

(b) *2–4 dagar per vecka (några dagar i veckan)*

(c) *1 dag i veckan (en dag i veckan)*

(d) *1–3 dagar i månaden (en eller några dagar i månaden)*

(e) *Mer sällan*

(f) *Aldrig*

Privata resor

(g) Hur ofta gjorde du privata resor, alltså alla andra resor än de som görs mellan hemmet och arbetet, **under februari i år**?

i. *5–7 dagar i veckan (dagligen eller nästan varje dag)*
ii. *2–4 dagar per vecka (några dagar i veckan)*
iii. *1 dag i veckan (en dag i veckan)*
iv. *1–3 dagar i månaden (en eller några dagar i månaden)*
v. *Mer sällan*
vi. *Aldrig*

(h) Vilket färdsätt använder du huvudsakligen under dessa resor?

i. *Till fots*
ii. *Cykel*
iii. *Moped*
iv. *MC*
v. *Kollektivtrafik*
vi. *Personbil, förare*
vii. *Personbil, passagerare*
viii. *Annat, specificera*

(i) Hur ofta åkte du bil (som förare eller passagerare) på privata resor **under februari i år**?

i. *5–7 dagar i veckan (dagligen eller nästan varje dag)*
ii. *2–4 dagar per vecka (några dagar i veckan)*
iii. *1 dag i veckan (en dag i veckan)*
iv. *1–3 dagar i månaden (en eller några dagar i månaden)*
v. *Mer sällan*
vi. *Aldrig*

(j) Hur ofta reste du med kollektivtrafik på privata resor **under februari i år**?

i. *5–7 dagar i veckan (dagligen eller nästan varje dag)*
ii. *2–4 dagar per vecka (några dagar i veckan)*
iii. *1 dag i veckan (en dag i veckan)*
iv. *1–3 dagar i månaden (en eller några dagar i månaden)*
v. *Mer sällan*
vi. *Aldrig*

Inkomst

(k) Hur stor var din månadsinkomst (före skatt) **under februari i år**? (Informationen är endast för statistiska ändamål och samlas in anonymt).

- Mellan 50 000 och 100 000
- Mellan 100 000 och 150 000
- Mellan 150 000 och 200 000
- Mellan 200 000 och 250 000
- Mellan 250 000 och 300 000
- Mellan 300 000 och 400 000
- Mellan 400 000 och 500 000
- Mellan 500 000 och 600 000
- Mellan 600 000 och 800 000
- Mellan 800 000 och 1 000 000
- Mellan 1 000 000 och 1 500 000
- Mellan 1 500 000 och 2 000 000
- Mellan 2 000 000 och 3 000 000
- Över 3 000 000

Oro för miljön

Människor runt om i världen är ofta oroade över miljöproblem på grund av de konsekvenser som uppkommer av att naturen påverkas. Men människor skiljer sig åt beträffande vilka konsekvenser som berör dem mest.

(l) För varje punkt nedan, ange på en skala från ” Inte alls viktigt” till ” Extremt viktigt” när du svarar på frågan: Jag är orolig för miljöproblem på grund av konsekvenserna för:

Randomisera ordningen på a – l nedan

i. Växter { *Inte alls viktigt, inte så viktigt, ganska oviktigt, neutralt, ganska viktigt, mycket viktigt, extremt viktigt*}

ii. Mig själv { *Inte alls viktigt, inte så viktigt, ganska oviktigt, neutralt, ganska viktigt, mycket viktigt, extremt viktigt*}

iii. Djur { *Inte alls viktigt, inte så viktigt, ganska oviktigt, neutralt, ganska viktigt, mycket viktigt, extremt viktigt*}

iv. Människor i mitt land { *Inte alls viktigt, inte så viktigt, ganska oviktigt, neutralt, ganska viktigt, mycket viktigt, extremt viktigt*}

v. Marint liv { *Inte alls viktigt, inte så viktigt, ganska oviktigt, neutralt, ganska viktigt, mycket viktigt, extremt viktigt*}

vi. Framtida generationer { *Inte alls viktigt, inte så viktigt, ganska oviktigt, neutralt, ganska viktigt, mycket viktigt, extremt viktigt*}

vii. Min livsstil { *Inte alls viktigt, inte så viktigt, ganska oviktigt, neutralt, ganska viktigt, mycket viktigt, extremt viktigt*}

viii. Alla människor { *Inte alls viktigt, inte så viktigt, ganska oviktigt, neutralt, ganska viktigt, mycket viktigt, extremt viktigt*}

ix. Fåglar { *Inte alls viktigt, inte så viktigt, ganska oviktigt, neutralt, ganska viktigt, mycket viktigt, extremt viktigt*}

x. Min hälsa { *Inte alls viktigt, inte så viktigt, ganska oviktigt, neutralt, ganska viktigt, mycket viktigt, extremt viktigt*}

xi. Barn { *Inte alls viktigt, inte så viktigt, ganska oviktigt, neutralt, ganska viktigt, mycket viktigt, extremt viktigt*}

xii. Min framtid { *Inte alls viktigt, inte så viktigt, ganska oviktigt, neutralt, ganska viktigt, mycket viktigt, extremt viktigt*}

Allmänna frågor

(m) Är du man eller kvinna? { *man kvinna*}

(n) Vilken är din ålder? { *heltalinmatning*}

(o) Vilket är ditt civilstånd? { *singel, gift, sambo*}

(p) Hur många barn har du som bor hemma i hushållet? { *heltalinmatning*}

(q) Vilken var din huvudsakliga sysselsättning **under februari i år**?

i. *Egen företagare*
ii. *Anställd, heltid*
iii. *Anställd, deltid*
iv. *Arbetar i eget hushåll (även vård av släktingar, 100% föräldraledighet)*
v. *Pensionerad (inklusive sjukpenning, aktivitetsersättning, 100% långvarig sjukfrånvaro, 100% sjukpenning, förtidspension)*
vi. *Studerande*
vii. *Arbetslös*
viii. *I arbetsmarknadsåtgärder (inte studier)*
ix. *Annan anställning*

(r) Bor du i enfamiljshus eller flerfamiljshus?

i. Enfamiljshus eller tvåfamiljshus (villa, radhus, kedjehus)
ii. Flerfamiljshus
iii. Annat ange vad____

Återkoppling

(s) Vill du lägga till något om hur enkäten var utformad? { *open string input*}

B.2 Choice Sets

Choice Sets 1-6 in Block 1, 7-12 in Block 2

Table B.2: Choice Set 1

	Milskatt och bränsleskatt efter 2030 Förslag 1	Milskatt och bränsleskatt efter 2030 Förslag 2	Endast bränsleskatt utan milskatt efter 2030
Bränsleskatt	6 kr/liter	6 kr/liter	6 kr/liter
I större städer			
Milskatt för elbilar	4 kr/mil	1 kr/mil	Ingen milskatt
Milskatt för bensin- och dieselbilar	2 kr/mil	Ingen milskatt	Ingen milskatt
På landsbygden			
Milskatt för elbilar	Ingen milskatt	1 kr/mil	Ingen milskatt
Milskatt för bensin- och dieselbilar	1 kr/mil	Ingen milskatt	Ingen milskatt
Jag är mest villig att acceptera	□	□	□
Vilket av de två alternativen med milskatt är du mest villig att acceptera?			
Jag är mest villig att acceptera	□	□	

Table B.3: Choice Set 2

	Milskatt och bränsleskatt efter 2030 Förslag 1	Milskatt och bränsleskatt efter 2030 Förslag 2	Endast bränsleskatt utan milskatt efter 2030
Bränsleskatt	3 kr/liter	6 kr/liter	6 kr/liter
I större städer			
Milskatt för elbilar	4 kr/mil	2 kr/mil	Ingen milskatt
Milskatt för bensin- och dieselbilar	5 kr/mil	Ingen milskatt	Ingen milskatt
På landsbygden			
Milskatt för elbilar	2 kr/mil	2 kr/mil	Ingen milskatt
Milskatt för bensin- och dieselbilar	1 kr/mil	Ingen milskatt	Ingen milskatt
Jag är mest villig att acceptera	□	□	□
Vilket av de två alternativen med milskatt är du mest villig att acceptera?			
Jag är mest villig att acceptera	□	□	

Table B.4: Choice Set 3

	Milskatt och bränsleskatt efter 2030 Förslag 1	Milskatt och bränsleskatt efter 2030 Förslag 2	Endast bränsleskatt utan milskatt efter 2030
Bränsleskatt	3 kr/liter	6 kr/liter	8 kr/liter
I större städer			
Milskatt för elbilar	4 kr/mil	3 kr/mil	Ingen milskatt
Milskatt för bensin- och dieselbilar	6 kr/mil	Ingen milskatt	Ingen milskatt
På landsbygden			
Milskatt för elbilar	1 kr/mil	1 kr/mil	Ingen milskatt
Milskatt för bensin- och dieselbilar	Ingen milskatt	Ingen milskatt	Ingen milskatt
Jag är mest villig att acceptera	□	□	□
Vilket av de två alternativen med milskatt är du mest villig att acceptera?			
Jag är mest villig att acceptera	□	□	

Table B.5: Choice Set 4

	Milskatt och bränsleskatt efter 2030 Förslag 1	Milskatt och bränsleskatt efter 2030 Förslag 2	Endast bränsleskatt utan milskatt efter 2030
Bränsleskatt	6 kr/liter	8 kr/liter	8 kr/liter
I större städer			
Milskatt för elbilar	3 kr/mil	3 kr/mil	Ingen milskatt
Milskatt för bensin- och dieselbilar	4 kr/mil	Ingen milskatt	Ingen milskatt
På landsbygden			
Milskatt för elbilar	2 kr/mil	Ingen milskatt	Ingen milskatt
Milskatt för bensin- och dieselbilar	2 kr/mil	Ingen milskatt	Ingen milskatt
Jag är mest villig att acceptera	□	□	□
Vilket av de två alternativen med milskatt är du mest villig att acceptera?			
Jag är mest villig att acceptera	□	□	

Table B.6: Choice Set 5

	Milskatt och bränsleskatt efter 2030 Förslag 1	Milskatt och bränsleskatt efter 2030 Förslag 2	Endast bränsleskatt utan milskatt efter 2030
Bränsleskatt	3 kr/liter	7 kr/liter	7 kr/liter
I större städer			
Milskatt för elbilar	4 kr/mil	2 kr/mil	Ingen milskatt
Milskatt för bensin- och dieselbilar	2 kr/mil	Ingen milskatt	Ingen milskatt
På landsbygden			
Milskatt för elbilar	1 kr/mil	1 kr/mil	Ingen milskatt
Milskatt för bensin- och dieselbilar	2 kr/mil	Ingen milskatt	Ingen milskatt
Jag är mest villig att acceptera	□	□	□
Vilket av de två alternativen med milskatt är du mest villig att acceptera?			
Jag är mest villig att acceptera	□	□	

Table B.7: Choice Set 6

	Milskatt och bränsleskatt efter 2030 Förslag 1	Milskatt och bränsleskatt efter 2030 Förslag 2	Endast bränsleskatt utan milskatt efter 2030
Bränsleskatt	5 kr/liter	7 kr/liter	7 kr/liter
I större städer			
Milskatt för elbilar	3 kr/mil	3 kr/mil	Ingen milskatt
Milskatt för bensin- och dieselbilar	4 kr/mil	Ingen milskatt	Ingen milskatt
På landsbygden			
Milskatt för elbilar	1 kr/mil	2 kr/mil	Ingen milskatt
Milskatt för bensin- och dieselbilar	Ingen milskatt	Ingen milskatt	Ingen milskatt
Jag är mest villig att acceptera	□	□	□
Vilket av de två alternativen med milskatt är du mest villig att acceptera?			
Jag är mest villig att acceptera	□	□	

Table B.8: Choice Set 7

	Milskatt och bränsleskatt efter 2030 Förslag 1	Milskatt och bränsleskatt efter 2030 Förslag 2	Endast bränsleskatt utan milskatt efter 2030
Bränsleskatt	5 kr/liter	9 kr/liter	9 kr/liter
I större städer			
Milskatt för elbilar	2 kr/mil	3 kr/mil	Ingen milskatt
Milskatt för bensin- och dieselbilar	2 kr/mil	Ingen milskatt	Ingen milskatt
På landsbygden			
Milskatt för elbilar	1 kr/mil	1 kr/mil	Ingen milskatt
Milskatt för bensin- och dieselbilar	1 kr/mil	Ingen milskatt	Ingen milskatt
Jag är mest villig att acceptera	□	□	□
Vilket av de två alternativen med milskatt är du mest villig att acceptera?			
Jag är mest villig att acceptera	□	□	

Table B.9: Choice Set 8

	Milskatt och bränsleskatt efter 2030 Förslag 1	Milskatt och bränsleskatt efter 2030 Förslag 2	Endast bränsleskatt utan milskatt efter 2030
Bränsleskatt	5 kr/liter	9 kr/liter	9 kr/liter
I större städer			
Milskatt för elbilar	2 kr/mil	3 kr/mil	Ingen milskatt
Milskatt för bensin- och dieselbilar	2 kr/mil	Ingen milskatt	Ingen milskatt
På landsbygden			
Milskatt för elbilar	1 kr/mil	1 kr/mil	Ingen milskatt
Milskatt för bensin- och dieselbilar	1 kr/mil	Ingen milskatt	Ingen milskatt
Jag är mest villig att acceptera	□	□	□
Vilket av de två alternativen med milskatt är du mest villig att acceptera?			
Jag är mest villig att acceptera	□	□	

Table B.10: Choice Set 9

	Milskatt och bränsleskatt efter 2030 Förslag 1	Milskatt och bränsleskatt efter 2030 Förslag 2	Endast bränsleskatt utan milskatt efter 2030
Bränsleskatt	4 kr/liter	6 kr/liter	7 kr/liter
I större städer			
Milskatt för elbilar	2 kr/mil	1 kr/mil	Ingen milskatt
Milskatt för bensin- och dieselbilar	5 kr/mil	Ingen milskatt	Ingen milskatt
På landsbygden			
Milskatt för elbilar	Ingen milskatt	Ingen milskatt	Ingen milskatt
Milskatt för bensin- och dieselbilar	1 kr/mil	Ingen milskatt	Ingen milskatt
Jag är mest villig att acceptera	□	□	□
Vilket av de två alternativen med milskatt är du mest villig att acceptera?			
Jag är mest villig att acceptera	□	□	

Table B.11: Choice Set 10

	Milskatt och bränsleskatt efter 2030 Förslag 1	Milskatt och bränsleskatt efter 2030 Förslag 2	Endast bränsleskatt utan milskatt efter 2030
Bränsleskatt	4 kr/liter	8 kr/liter	8 kr/liter
I större städer			
Milskatt för elbilar	4 kr/mil	2 kr/mil	Ingen milskatt
Milskatt för bensin- och dieselbilar	6 kr/mil	Ingen milskatt	Ingen milskatt
På landsbygden			
Milskatt för elbilar	2 kr/mil	Ingen milskatt	Ingen milskatt
Milskatt för bensin- och dieselbilar	Ingen milskatt	Ingen milskatt	Ingen milskatt
Jag är mest villig att acceptera	□	□	□
Vilket av de två alternativen med milskatt är du mest villig att acceptera?			
Jag är mest villig att acceptera	□	□	

Table B.12: Choice Set 11

	Milskatt och bränsleskatt efter 2030 Förslag 1	Milskatt och bränsleskatt efter 2030 Förslag 2	Endast bränsleskatt utan milskatt efter 2030
Bränsleskatt	4 kr/liter	8 kr/liter	8 kr/liter
I större städer			
Milskatt för elbilar	4 kr/mil	2 kr/mil	Ingen milskatt
Milskatt för bensin- och dieselbilar	6 kr/mil	Ingen milskatt	Ingen milskatt
På landsbygden			
Milskatt för elbilar	2 kr/mil	Ingen milskatt	Ingen milskatt
Milskatt för bensin- och dieselbilar	Ingen milskatt	Ingen milskatt	Ingen milskatt
Jag är mest villig att acceptera	□	□	□
Vilket av de två alternativen med milskatt är du mest villig att acceptera?			
Jag är mest villig att acceptera	□	□	

Table B.13: Choice Set 12

	Milskatt och bränsleskatt efter 2030 Förslag 1	Milskatt och bränsleskatt efter 2030 Förslag 2	Endast bränsleskatt utan milskatt efter 2030
Bränsleskatt	4 kr/liter	8 kr/liter	8 kr/liter
I större städer			
Milskatt för elbilar	4 kr/mil	2 kr/mil	Ingen milskatt
Milskatt för bensin- och dieselbilar	6 kr/mil	Ingen milskatt	Ingen milskatt
På landsbygden			
Milskatt för elbilar	2 kr/mil	Ingen milskatt	Ingen milskatt
Milskatt för bensin- och dieselbilar	Ingen milskatt	Ingen milskatt	Ingen milskatt
Jag är mest villig att acceptera	□	□	□
Vilket av de två alternativen med milskatt är du mest villig att acceptera?			
Jag är mest villig att acceptera	□	□	

Appendix C

(Appendix Analysis)

C.1 Full Reproducible Code

C.1.1 R Code

```
### Install packages if necessary
library(haven) # Data Import
library(psych) # Descriptives
library(tidyverse) #Data Manipulation

library(stargazer) #Tables export
library(lemon) # Graphics Formatting

library(dataMaid) #Codebook

# Read in data
rm(list=ls())
df <- read_dta("milage_tax.dta")

for (i in 1:length(df)){
  if (class(df[[i]]) == 'labelled'){
    df[[i]][df[[i]] < 0 ] = NA
  }
}

data <-  as_factor(df, only_labelled = TRUE, ordered = TRUE)



###### Treatment Dummies #######
data <- data %>%
  mutate(keep_tax_dummy = ifelse(treatment == "T2", 1, 0 )
  )
```

```r
data <- data %>%
  mutate(reduce_subsidy_dummy = ifelse(treatment == "T3", 1, 0 )
  )

data <- data %>%
  mutate(increase_tax_dummy = ifelse(treatment == "T4", 1, 0 )
  )


data <- data %>%
  rename("id" = "token")%>%
  mutate(id = rownames(data))


data$group <- factor(data$group, ordered=FALSE)
data$gender <- factor(data$gender, ordered=FALSE)

##### Combine Subscales ######

#Generate keys for mapping items to sub-scales
keys.list <-  list(acceptability = c("a1","a2"),
                   prt = c("a4_4", "a4_5", "a4_6", "a4_7", "a4_8",
                    ↪  "a4_9", "a4_10"),
                   prt_threat= c("a4_1","a4_2","a4_3"),
                   prt_anger = c("a4_4", "a4_5", "a4_6"),
                   prt_cognition = c("a4_7", "a4_8", "a4_9",
                    ↪  "a4_10"),
                   ec_biospheric = c("g2_1","g2_3","g2_5", "g2_9"),
                   ec_egoistic = c("g2_10", "g2_7", "g2_2", "g2_12"),
                   ec_altruistic = c("g2_4", "g2_6", "g2_11",
                    ↪  "g2_8"),
                   ec = c("g2_1","g2_2", "g2_3", "g2_4", "g2_5",
                    ↪  "g2_6",
                          "g2_7", "g2_8", "g2_9", "g2_10", "g2_11",
                           ↪  "g2_12"))


#Save scale metrics including alpha
scale_metrics <- scoreItems(keys.list, data)

scale_scores <- as.data.frame(scale_metrics$scores)

summary(scale_scores)
scale_metrics$alpha
#Bind scale scores to work data frame

data <-  bind_cols(data, scale_scores)
```

```
#### Re-bin income into low, medium and high income groups
data$f1 <- as.numeric(data$f1)
data <- data %>%
  mutate(inc = ifelse(f1 <= 4, 1,
                      ifelse (f1>=7, 3, 2)))

data$inc <- factor(data$inc, label =c("Below 25 SEK"," Between 25 and
↪  40 SEK", "Above 40  SEK"))
data$a3 <- factor(data$a3, ordered=FALSE)
data$c3 <- factor(data$c3, ordered=FALSE)



save(data, file="working_data.Rdata")

write_csv(data, path="working_data.csv")

# Label new variables for codebook and produce codebook

var.labels <- c(acceptability = "Combined Acceptance and Support Item
↪  Scale",
                prt = "Combined Reactance Scale",
                prt_threat= "Combined Threat Item Scale",
                prt_anger = "Combined Anger Item Scale",
                prt_cognition = "Combined Negative Cognition Item
                ↪  Scale",
                ec_biospheric = "Combined Biospheric Concern Item
                ↪  Scale",
                ec_egoistic = "Combined Egoistic Concern Item Scale",
                ec_altruistic = "Combined Altruistic Concern Item
                ↪  Scale",
                ec = "Environmental Concern Scale")

data <- Hmisc::upData(data, labels = var.labels)
makeCodebook(data, reportTitle ="Codebook for Road Pricing
↪  Acceptability Study", replace=TRUE)

####### Begin Descriptive Data #####

############## Begin Sample Description ############
#Gather Sample Variables
des_var <-  data %>%
  select(age, gender, group, c3, f1)

des_tot <- des_var %>%
  describe(na.rm=TRUE)

# Statistics by Living Area
```

```
des_area <- des_var %>%
  describeBy(group = 'group', na.rm = TRUE)

des_tot
des_area



###### Demographics by Treatment Group
library(summarytools)
library(psych)
des_treatment <- data %>%
  select(age)%>%
  describeBy(group = data$treatment, na.rm=TRUE)

des_treatment_freq

str(data$treatment)

####### Background Information Graphs

###### Income #####
data$f1 <- factor(data$f1)
data$Treatment <- factor(data$treatment,
                         labels= c("Keep Subsidies", "Keep Taxes",
                                   "Decrease Subsidies", "Increase
                                    ↪  Taxes"))

income_dist <- ggplot(data, aes(f1, fill =Treatment)) +
  geom_histogram(stat="count")+
  xlab("Income Group") +
  ylab("Count")+
  theme(axis.text.x = element_text(angle = 30, hjust = 1)) +
  scale_x_discrete(labels= c("<10", "15", "20", "25", "30", "40",
                             "50", "60", "80", "100", "150", "200",
                              ↪  ">300", "NA"))+
  theme_minimal()

income_dist <- ggplot(data, aes(inc, fill =Treatment)) +
  geom_histogram(stat="count")+
  xlab("Income Group") +
  ylab("Count")+
  theme(axis.text.x = element_text(angle = 30, hjust = 1)) +
  theme_minimal()


#### Environmental Concern
```

```
ec_graphs <-  data %>% select(id, treatment, gender, group,
↪  starts_with("ec"))%>%
  rename("Treatment" = "treatment", "Biospheric Concern" =
   ↪  "ec_biospheric", "Egoistic Concern" = "ec_egoistic",
         "Altruisitc Concern" = "ec_altruistic", "Environmental
          ↪  Concern" = "ec")

ec_long <- reshape2::melt(ec_graphs, id.vars = c("id", "Treatment",
↪  "gender", "group"))

ec_hist <- ggplot(ec_long, aes(x = value, fill=Treatment)) +
  geom_histogram(alpha = 0.9, stat = "count") +
  facet_wrap( ~ variable, scales = "free")+
  xlab("Rating (1-7 Scale)") +
  ylab("Count")+
  theme(axis.text.x = element_text(angle = 30, hjust = 1)) +
  theme_minimal()

##### Driving Distance

driving_dist <- data %>% select(id, treatment, gender, group,  c6)%>%
  rename("Treatment" = "treatment", "Yearly Driving Distance" = "c6")

driv_long <- reshape2::melt(driving_dist, id.vars = c("id",
↪  "Treatment", "gender", "group"))


ggplot(driv_long, aes(x = Treatment, y = value, color=Treatment)) +
  geom_boxplot() +
  facet_wrap( ~ variable, scales = "free")+
  xlab("Treatment Group") +
  ylab("Distance in Swedish Miles")+
  scale_color_brewer(palette = "Dark2", name=element_blank())+
  theme(axis.text.x = element_text(angle = 30, hjust = 1)) +
  theme_minimal()


#Exclude worst oultiers

driving_dist <- data %>% select(id, treatment, gender, group,  c6)%>%
  filter(c6 < 40000)%>%
  rename("Treatment" = "treatment", "Yearly Driving Distance" = "c6")

driv_long <- reshape2::melt(driving_dist, id.vars = c("id",
↪  "Treatment", "gender", "group"))


ggplot(driv_long, aes(x = Treatment, y = value, color=Treatment)) +
```

```
  geom_boxplot() +
  facet_wrap( ~ variable, scales = "free")+
  xlab("Treatment Group") +
  ylab("Distance in Swedish Miles")+
  scale_color_brewer(palette = "Dark2", name=element_blank())+
  theme(axis.text.x = element_text(angle = 30, hjust = 1)) +
  theme_minimal()


###### Analysis of Framing Experiment
library(lavaan) #SEM
library(semPlot)

rm(list=ls())

load("working_data.csv")

######### Examining means of treatment groups for composite scales
######### and fairness item ######################################

means <- data %>%
  select(a3, starts_with("prt_"), acceptability, treatment) %>%
  describeBy(., group="treatment")


means_change_eff <- data %>%
  select(a3,a2, starts_with("prt_"), acceptability,
  ↪  ends_with("dummy")) %>%
  describeBy(., group="change_dummy")

means_tax_eff <- data %>%
  select(a3, starts_with("prt_"), acceptability, ends_with("dummy"))
  ↪  %>%
  describeBy(., group="tax_dummy")

data$treatment <-  factor(data$treatment,
                          labels = c("Keep Subsidies", "Keep Taxes",
                          ↪  "Decrease Subsidies",  "Increase
                          ↪  Taxes"))

means_tax_eff
means_change_eff

means

##### Boxplots #####
graphing_data <-  data %>% select(id, treatment, gender, group, a1,
↪  a2, acceptability,
```

```
                                    prt_threat, prt_anger,
                                    ↪  prt_cognition, a3)

graphing_data$treatment <- factor(graphing_data$treatment,
                                    labels= c("Keep Subsidies", "Keep
                                    ↪  Taxes",
                                            "Decrease Subsidies",
                                            ↪  "Increase Taxes"))
graphing_data <- graphing_data %>% rename("Support"="a1",
↪  "Accept"="a2", "Acceptability" ="acceptability",
                                            "Fairness"="a3",
                                            ↪  "Threat"="prt_threat",
                                            ↪  "Anger"="prt_anger",
                                            ↪  "Neg.Cognition"="prt_cognition")

long <- reshape2::melt(graphing_data, id.vars = c("id", "treatment",
↪  "gender", "group"))

FE_Boxplot <- ggplot(long, aes(x = treatment, y = value,
↪  color=treatment)) +
  geom_boxplot() +
  facet_wrap( ~ variable, scales = "free")+
  xlab("Treatment")+
  ylab("Rating (1-7 Scale)")


FE_box_formatted<- FE_Boxplot +
  theme(axis.text.x = element_text(angle = 30, hjust = 1))+
  scale_color_brewer(palette = "Dark2", name=element_blank())+
  scale_x_discrete(name ="Treatment", labels =c("1","2","3","4"))+
  theme_minimal()

FE_box_out <- reposition_legend(FE_box_formatted, 'center',
↪  panel='panel-3-3')

ggsave(
  "FE_Boxplot.png",
  plot = last_plot(),
  device = "png",
  path =
  ↪  "/Users/philippkreutzer/Documents/Lund/MasterThesis2020/Analysis/Master_Thesi
  width = 150,
  unit = "mm"
)


rm(list=setdiff(ls(), "data"))
```

```
######## Creates Correlation table for variables of Framing
↪  Experiment #####

fe_cor <-  data %>%
  select(., change_dummy, tax_dummy, starts_with("prt_"), a3,
  ↪  acceptability) %>%
  cor() %>%
  round( digits = 3)

## Keeps only the lower part of the correlation table
upper.tri(fe_cor, diag = TRUE)
upper<-fe_cor
upper[upper.tri(fe_cor)]<-""
upper<-as.data.frame(upper)
upper


#################### Part for SEM ################################

data$a3 <- as.numeric(data$a3)
#Build confirmatory factor analyis model using lavaan
cfa_prt <- '

              # Regression
               f_prt ~ f_threat

              # Measurement model
               f_prt =~ f_anger + f_cognition
               f_threat =~ a4_1 + a4_2 + a4_3
               f_anger =~ a4_4 + a4_5 + a4_6
               f_cognition =~ a4_7 + a4_8 + a4_9 +a4_10 '

# Build structural model
sem_model <- '
              # Measurement model
               f_accept =~ a1 + 1*a2
               f_prt =~  f_anger + f_cognition
               f_threat =~ a4_1 + a4_2 + a4_3
               f_anger =~ a4_4 + a4_5 + a4_6
               f_cognition =~ a4_7 + a4_8 + a4_9 +a4_10

              # Regressions
                f_accept ~ f_prt + a3
                f_prt ~ f_threat

'
```

```
fit_cfa_model <- sem(cfa_prt, data, estimator="WLSMV", std.lv=FALSE,
↪  sample.mean = TRUE)
summary(fit_cfa_model, fit=TRUE, modindices=FALSE, standardized=TRUE)
semPaths(fit_cfa_model, what = "std", layout = "tree2")

fit_sem_model <- sem(sem_model,data, estimator="WLSMV",std.lv=FALSE,
↪  sample.mean = TRUE)
summary(fit_sem_model, fit=TRUE, modindices=FALSE, standardized=TRUE)

semPaths(fit_sem_model, what = "std", layout = "tree2")



#### Regressions #####
library(lmtest)
library(sandwich) # for calculating robust standard errors
data$a3 <- factor(data$a3)
reg_acc <- lm(acceptability ~ keep_tax_dummy + reduce_subsidy_dummy +
↪  increase_tax_dummy + prt + a3, data = data)
reg_acc_cont <- lm(acceptability ~ keep_tax_dummy +
↪  reduce_subsidy_dummy + increase_tax_dummy + prt + a3 +
                    gender + group + inc + c3 + ec + age, data =
                     ↪  data)

reg_prt <-  lm(prt ~ keep_tax_dummy + reduce_subsidy_dummy +
↪  increase_tax_dummy + prt_threat, data = data)

reg_prt_cont <- lm(prt ~ keep_tax_dummy + reduce_subsidy_dummy +
↪  increase_tax_dummy +
                            prt_threat +
                            gender + group + inc + c3 + ec + age,
                             ↪  data = data)


# Adjust standard errors Acceptability
cov_r_a         <- vcovHC(reg_acc, type = "HC1")
robust_se_ra    <- sqrt(diag(cov_r_a ))

# Adjust F statistic
wald_results_a <- waldtest(reg_acc, vcov = cov_r_a )

# Adjust standard errors acceptabilty controlled
cov_r_a_c        <- vcovHC(reg_acc_cont, type = "HC1")
robust_se_ra_c    <- sqrt(diag(cov_r_a_c ))

# Adjust F statistic
wald_results_a_c <- waldtest(reg_acc_cont, vcov = cov_r_a_c )
```

```
# Adjust standard errors prt
cov_r_prt         <- vcovHC(reg_prt, type = "HC1")
robust_se_prt    <- sqrt(diag(cov_r_prt))
robust_se_prt
# Adjust F statistic
wald_results_prt <- waldtest(reg_prt, vcov = cov_r_prt )

# Adjust standard errors prt controlled
cov_r_prt_c       <- vcovHC(reg_prt_cont, type = "HC1")
robust_se_prt_c    <- sqrt(diag(cov_r_a_c ))
robust_se_prt_c
# Adjust F statistic
wald_results_prt_c <- waldtest(reg_prt_cont, vcov = cov_r_prt_c )

wald_results_a
wald_results_a_c
wald_results_prt
wald_results_prt_c

stargazer(reg_acc, reg_acc_cont, reg_prt, reg_prt_cont,
          se = list(robust_se_ra, robust_se_ra_c, robust_se_prt,
          ↪  robust_se_prt_c),
          omit.stat = "f",
          covariate.labels=c("Tax Main Effect (Keep Tax)", "Change
          ↪  Main Effect (Reduce Subsidy)", "Change $\times$ Tax
          ↪  Effect (Increase Tax)",
                             "Reactance",
                             "Unfair", "Somewhat Unfair", "Neutral",
                             ↪  "Somewhat Fair", "Very Fair",
                             "Male", "Rural", "Between 25 and 40
                             ↪  SEK",
                             "Above 40  SEK","No Car Access",
                             "Environmental Concern", "Age", "Threat
                             ↪  to Freedom"),
          add.lines = list(c("F Statistic", "217.48*** (df = 9;
          ↪  397)", "121.66*** (df = 16; 390)",
                             "252.92 (df = 4; 402)", "97.72* (df =
                             ↪  11; 395)")))


##### Logit for Fairness Item

# log odds ratio of choosing item or lower compared to higher
↪  response
reg_unfair <- glm(I(as.numeric(a3) >= 2) ~ keep_tax_dummy +
↪  reduce_subsidy_dummy + increase_tax_dummy, family="binomial",
↪  data = data)
```

```
reg_s_unfair <- glm(I(as.numeric(a3) >= 3) ~ keep_tax_dummy +
↪  reduce_subsidy_dummy + increase_tax_dummy, family="binomial",
↪  data = data)
reg_n_fair <- glm(I(as.numeric(a3) >= 4) ~ keep_tax_dummy +
↪  reduce_subsidy_dummy + increase_tax_dummy, family="binomial",
↪  data = data)
reg_s_fair <- glm(I(as.numeric(a3) >= 5) ~ keep_tax_dummy +
↪  reduce_subsidy_dummy + increase_tax_dummy, family="binomial",
↪  data = data)
reg_v_fair <- glm(I(as.numeric(a3) >= 6) ~ keep_tax_dummy +
↪  reduce_subsidy_dummy + increase_tax_dummy, family="binomial",
↪  data = data)


# Including covariates
reg_unfair_c <- glm(I(as.numeric(a3) >= 2) ~ keep_tax_dummy +
↪  reduce_subsidy_dummy + increase_tax_dummy +
                     gender + group + inc + c3 + ec + age,
                     ↪  family="binomial", data = data)
reg_s_unfair_c <- glm(I(as.numeric(a3) >= 3) ~ keep_tax_dummy +
↪  reduce_subsidy_dummy + increase_tax_dummy +
                       gender + group + inc + c3 + ec + age,
                       ↪  family="binomial", data = data)
reg_n_fair_c <- glm(I(as.numeric(a3) >= 4) ~ keep_tax_dummy +
↪  reduce_subsidy_dummy + increase_tax_dummy +
                     gender + group + inc + c3 + ec + age,
                     ↪  family="binomial", data = data)
reg_s_fair_c <- glm(I(as.numeric(a3) >= 5) ~ keep_tax_dummy +
↪  reduce_subsidy_dummy + increase_tax_dummy +
                     gender + group + inc + c3 + ec + age,
                     ↪  family="binomial", data = data)
reg_v_fair_c <- glm(I(as.numeric(a3) >= 6) ~ keep_tax_dummy +
↪  reduce_subsidy_dummy + increase_tax_dummy +
                     gender + group + inc + c3 + ec + age,
                     ↪  family="binomial", data = data)



# Output as latex table with exponated odds ratio and t statisics
↪  for linear model

models <- list(reg_unfair, reg_unfair_c, reg_s_unfair,
↪  reg_s_unfair_c, reg_n_fair, reg_n_fair_c,
               reg_s_fair,reg_s_fair_c, reg_v_fair,
               reg_v_fair_c)
stargazer(models, apply.coef=exp, t.auto=F, p.auto=F, report =
↪  "vct*")
```

```
##### Analysis of Choice Experiment ####
library(mlogit) # Provides multinominal logit model

rm(list=ls())

conj_df <- read_dta("merged_workfile_mileage_tax.dta")

for (i in 1:length(conj_df)){
  if (class(conj_df[[i]]) == 'labelled'){
    conj_df[[i]][conj_df[[i]] < 0 ] = NA
  }
}

conj_data <- as_factor(conj_df, only_labelled = TRUE, ordered = TRUE)

#### Dummies for gender, rural, car access
conj_data <- conj_data %>% mutate(male = ifelse(gender == "Man", 1,
↪  0))
conj_data <- conj_data %>% mutate(rural = ifelse(group ==
↪  "Landsbygd", 1, 0))
conj_data <- conj_data %>% mutate(no_car = ifelse(c3 == "Nej", 1, 0))


## Generate Dummies for Choice
conj_data <-conj_data %>%
  mutate(choice1 = ifelse(as.numeric(val_I) == alternative, 1, 0 )
  )
conj_data <- conj_data %>%
  mutate(choice2 = ifelse(as.numeric(val_II) == alternative, 1, 0 )
  )

# Generate Dummies for Treatment Conditions
conj_data <- conj_data %>%
  mutate(keep_tax_dummy = ifelse(treatment == 2, 1, 0 )
  )

conj_data <- conj_data %>%
  mutate(reduce_subsidy_dummy = ifelse(treatment == 3, 1, 0 )
  )

conj_data <- conj_data %>%
  mutate(increase_tax_dummy = ifelse(treatment == 4, 1, 0 )
  )
```

```
### Add Scale Means
#Generate keys for mapping items to sub-scales
keys.list <-  list(acceptability = c("a1","a2"),
                   prt = c("a4_4", "a4_5", "a4_6","a4_7", "a4_8",
                   ↪  "a4_9", "a4_10"),
                   prt_threat= c("a4_1","a4_2","a4_3"),
                   prt_anger = c("a4_4", "a4_5", "a4_6"),
                   prt_cognition = c("a4_7", "a4_8", "a4_9",
                   ↪  "a4_10"),
                   ec_biospheric = c("g2_1","g2_3","g2_5", "g2_9"),
                   ec_egoistic = c("g2_10", "g2_7", "g2_2", "g2_12"),
                   ec_altruistic = c("g2_4", "g2_6", "g2_11",
                   ↪  "g2_8"),
                   ec = c("g2_1","g2_2", "g2_3", "g2_4", "g2_5",
                   ↪  "g2_6",
                         "g2_7", "g2_8", "g2_9", "g2_10", "g2_11",
                         ↪  "g2_12"))

scale_metrics <- scoreItems(keys.list, conj_data)
scale_scores <-  as.data.frame(scale_metrics$score)
working_data <-  bind_cols(conj_data, scale_scores)



######### Split data into Choice 1 and Choice 2 and prepare for
↪  analysis in mlogit package

working_data <-  working_data %>%
  mutate(str = survival::strata(working_data$id, working_data$set,
  ↪  shortlabel = TRUE, sep = "0"))

c1_data <- working_data

c2_data <- working_data %>% filter(alternative != 3)


write_dta(c1_data, path = "c1_data.dta")
write_dta(c2_data, path = "c2_data.dta")

###### How many unique people voted for alternative 3

inspection <- c1_data %>% filter(as.numeric(val_I) == 3)
length(summary(as.factor((unique(inspection$id))))) # count

# Find those ids that chose no vmt every time
all_no <- subset(inspection, ave(id, id, FUN = length) > 17)

length(summary(as.factor((unique(all_no$id))))) #count
```

```
#### Graphically inspect
all_no$Treatment <- factor(all_no$treatment,
                           labels= c("Keep Subsidies", "Keep
                           ↪  Taxes",
                                     "Decrease Subsidies",
                                     ↪  "Increase Taxes"))

ggplot(all_no)+
  geom_histogram(aes(c3, fill = Treatment), stat="count")+
  xlab("Car Owner") +
  ylab("Count")+
  theme(axis.text.x = element_text(angle = 30, hjust = 1)) +
  theme_minimal()

ggplot(all_no)+
  geom_histogram(aes(group, fill = Treatment), stat="count")+
  xlab("Living Area") +
  ylab("Count")+
  theme(axis.text.x = element_text(angle = 30, hjust = 1)) +
  theme_minimal()

ggplot(all_no)+
  geom_histogram(aes(Treatment), stat="count")+
  xlab("Treatment Condition") +
  ylab("Count")+
  theme(axis.text.x = element_text(angle = 30, hjust = 1)) +
  theme_minimal()

ggplot(all_no)+
  geom_boxplot(aes(Treatment, b2, color=Treatment))+
  xlab("Treatment")+
  ylab("Rating (1-7 Scale)")+
  theme(axis.text.x = element_text(angle = 30, hjust = 1))+
  scale_color_brewer(palette = "Dark2", name=element_blank())+
  scale_x_discrete(name ="Treatment", labels =c("1","2","3","4"))+
  theme_minimal()


##### Reactance and Fairness

prt_all_no <-  all_no %>% select(id, treatment, a1, a2,
↪  acceptability, prt,
                                 prt_threat, prt_anger,
                                 ↪  prt_cognition, a3)
prt_all_no$a3 <- as.numeric(prt_all_no$a3)
```

```
prt_all_no$treatment <- factor(prt_all_no$treatment,
                               labels= c("Keep Subsidies", "Keep
                                ↪  Taxes",
                                      "Decrease Subsidies",
                                       ↪  "Increase Taxes"))

prt_all_no <- prt_all_no %>% rename("Support"="a1", "Accept"="a2",
↪  "Acceptability" ="acceptability",
                                    "Fairness"="a3",
                                     ↪  "Threat"="prt_threat",
                                     ↪  "Anger"="prt_anger",
                                     ↪  "Neg.Cognition"="prt_cognition")


# Fairness boxplot
ggplot(prt_all_no)+
  geom_boxplot(aes(treatment, Fairness, color=treatment))+
  xlab("Treatment")+
  ylab("Rating (1-7 Scale)")+
  theme(axis.text.x = element_text(angle = 30, hjust = 1))+
  scale_color_brewer(palette = "Dark2", name=element_blank())+
  scale_x_discrete(name ="Treatment", labels =c("1","2","3","4"))+
  theme_minimal()

# Acceptability boxplot

ggplot(prt_all_no)+
  geom_boxplot(aes(treatment, Acceptability, color=treatment))+
  xlab("Treatment")+
  ylab("Rating (1-7 Scale)")+
  theme(axis.text.x = element_text(angle = 30, hjust = 1))+
  scale_color_brewer(palette = "Dark2", name=element_blank())+
  scale_x_discrete(name ="Treatment", labels =c("1","2","3","4"))+
  theme_minimal()

# PRT Boxplot
ggplot(prt_all_no)+
  geom_boxplot(aes(treatment, prt, color=treatment))+
  xlab("Treatment")+
  ylab("Rating (1-7 Scale)")+
  theme(axis.text.x = element_text(angle = 30, hjust = 1))+
  scale_color_brewer(palette = "Dark2", name=element_blank())+
  scale_x_discrete(name ="Treatment", labels =c("1","2","3","4"))+
  theme_minimal()
```

C.1.2 Stata Code

```
*************************************************************************
* Data was manipulated in R to include composite scores
* for environmental concern and other variables
*****
* Dummies for treatments were created. Basecondition == Keep
↪  subsidies
* Keep_taxing == T2, Decrease Subsidies == T3, Increase taxes == T4
*****
* Make sure files c1_data.dta and c2_data.dta are in working
↪  directory
*************************************************************************


use "c1_data.dta"

asclogit choice1  fuel_tax city_tax_ev city_tax_cv rur_tax_ev
↪  rur_tax_cv, ///
                        case(str) alternatives(alternative) ///
                        base (3) or
estat mfx, at (mean)



estimates store mpure

asclogit choice1  fuel_tax city_tax_ev city_tax_cv rur_tax_ev
↪  rur_tax_cv, ///
                case(str) alternatives(alternative) casevars(i.male
                ↪  i.rural age f1 i.no_car ///
                                b2 b5 b6 b8  ec )          ///
                base (3) or


estat mfx, at(mean male=0 rural=0 no_car=0)

estimates store mfull

asclogit choice1  fuel_tax city_tax_ev city_tax_cv rur_tax_ev
↪  rur_tax_cv, ///
                case(str) alternatives(alternative) casevars(i.male
                ↪  i.rural age f1 i.no_car b2 b5 b6 b8  ec
                ↪  i.keep_tax_dummy
                ↪  i.reduce_subsidy_dummy        i.increase_tax_dummy)
                ↪  ///
                base (3) or
```

```
estat mfx, at(mean male=0 rural=0 no_car=0 keep_tax_dummy=0
↪  reduce_subsidy_dummy=0 ///
                                increase_tax_dummy=0)


est store mtreatment

use "c2_data.dta"

asclogit choice2  fuel_tax city_tax_ev city_tax_cv rur_tax_ev
↪  rur_tax_cv, ///
                        case(str) alternatives(alternative) ///
                        base (2) or

estat mfx, at(mean)

est store mpure2

asclogit choice2  fuel_tax city_tax_ev city_tax_cv rur_tax_ev
↪  rur_tax_cv, ///
                case(str) alternatives(alternative) casevars(i.male
                ↪  i.rural age f1 i.no_car ///
                                b2 b5 b6 b8  ec ) ///
                base (2) or

estat mfx, at(mean male=0 rural=0 no_car=0)

est store mfull2


 asclogit choice2  fuel_tax city_tax_ev city_tax_cv rur_tax_ev
 ↪  rur_tax_cv, ///
                case(str) alternatives(alternative) casevars(i.male
                ↪  i.rural age f1 i.no_car ///
                                b2 b5 b6 b8  ec ///
                                i.keep_tax_dummy
                                ↪  i.reduce_subsidy_dummy        i.increase_tax_du
                                ↪  ///
                base (2) or

estat mfx, at(mean male=0 rural=0 no_car=0 keep_tax_dummy=0 ///
reduce_subsidy_dummy=0 increase_tax_dummy=0)

est store mtreatment2
```

C.2 Additional Figures

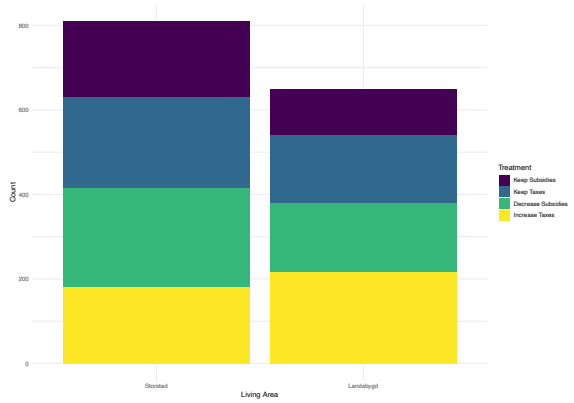


Figure C.1: Living Area of Never VMT Voters

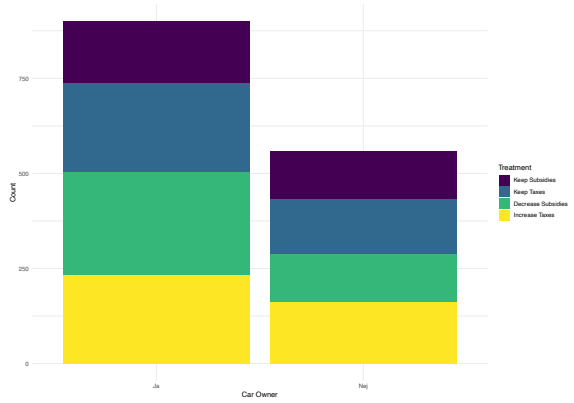


Figure C.2: Car Access of Never VMT Voters

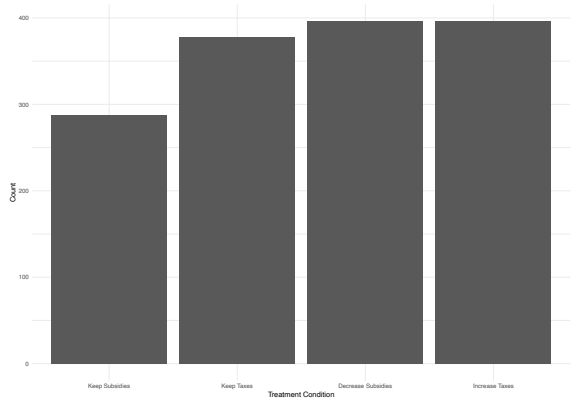


Figure C.3: Treatment Group of Never VMT Voters

C.3 Codebook

Codebook for Road Pricing Acceptability Master Thesis

Autogenerated data summary from dataMaid

Philipp Jonas Kreutzer

June 22, 2020

Data report overview

The dataset examined has the following dimensions:

Feature	Result
Number of observations	407
Number of variables	127

Codebook summary table

Label	Variable	Class	# unique values	Missing	Description
	id	character	407	0.00 %	
	gender	factor	2	0.00 %	
Ålder	**age**	numeric	63	0.00 %	
Region	**nuts2**	ordered	9	0.25 %	
Postnummer	**postalcode**	numeric	369	0.00 %	
Kommun	**kommun**	character	92	0.00 %	
	group	factor	2	0.00 %	
Behandling	**treatment**	ordered	4	0.00 %	
Block	**block**	ordered	2	0.00 %	
Val 1	**set_1**	numeric	7	1.47 %	
Val 2	**set_2**	numeric	7	1.47 %	
Val 3	**set_3**	numeric	7	1.47 %	
Val 4	**set_4**	numeric	7	1.47 %	
Val 5	**set_5**	numeric	7	1.47 %	
Val 6	**set_6**	numeric	7	1.47 %	
Stödjer du att en milskatt införs?	**a1**	ordered	7	0.00 %	
Skulle du kunna acceptera att en milskatt införs?	**a2**	ordered	7	0.00 %	
	a3	factor	6	0.00 %	
[Budskapet hotade min frihet att välja.] Frågor om hur förslaget presenterades i	**a4_1**	ordered	7	0.00 %	

Label	Variable	Class	# unique values	Missing	Description
[Budskapet försökte fatta ett beslut åt mig.] Frågor om hur förslaget presentera	**a4_2**	ordered	7	0.00 %	
[Budskapet försökte manipulera mig.] Frågor om hur förslaget presenterades i bud	**a4_3**	ordered	7	0.00 %	
[Det här budskapet gjorde mig arg.] Frågor om hur förslaget presenterades i buds	**a4_4**	ordered	7	0.00 %	
[Det här budskapet irriterade mig.] Frågor om hur förslaget presenterades i buds	**a4_5**	ordered	7	0.00 %	
[Det här budskapet gjorde mig förargad.] Frågor om hur förslaget presenterades i	**a4_6**	ordered	7	0.00 %	
[Jag insåg att jag letade efter brister hos det sätt som informationen presenter	**a4_7**	ordered	7	0.00 %	
[Jag kunde inte låta bli att tänka på vilka sätt som den information som present	**a4_8**	ordered	7	0.00 %	
[Jag insåg att jag tänkte på varför jag inte håller med om vad som presenterades	**a4_9**	ordered	7	0.00 %	
[Jag kände att jag ville “argumentera mot” det som fanns i budskapet.] Frågor om	**a4_10**	ordered	7	0.00 %	
[Jag är mest villig att acceptera] Markera i rutan under det alternativ som du	**val1_1**	ordered	3	0.00 %	

Label	Variable	Class	# unique values	Missing	Description
[Vilket av de två alternativen med milskatt är du mest villig att acceptera?] M	**val1_2**	ordered	2	0.00 %	
[Jag är mest villig att acceptera] Markera i rutan under det alternativ som du	**val2_1**	ordered	3	0.00 %	
[Vilket av de två alternativen med milskatt är du mest villig att acceptera?] M	**val2_2**	ordered	2	0.00 %	
[Jag är mest villig att acceptera] Markera i rutan under det alternativ som du	**val3_1**	ordered	3	0.00 %	
[Vilket av de två alternativen med milskatt är du mest villig att acceptera?] M	**val3_2**	ordered	2	0.00 %	
[Jag är mest villig att acceptera] Markera i rutan under det alternativ som du	**val4_1**	ordered	3	0.00 %	
[Vilket av de två alternativen med milskatt är du mest villig att acceptera?] M	**val4_2**	ordered	2	0.00 %	
[Jag är mest villig att acceptera] Markera i rutan under det alternativ som du	**val5_1**	ordered	3	0.00 %	
[Vilket av de två alternativen med milskatt är du mest villig att acceptera?] M	**val5_2**	ordered	2	0.00 %	
[Jag är mest villig att acceptera] Markera i rutan under det alternativ som du	**val6_1**	ordered	3	0.00 %	
[Vilket av de två alternativen med milskatt är du mest villig att acceptera?] M	**val6_2**	ordered	2	0.00 %	

Label	Variable	Class	# unique values	Missing	Description
De totala skattebetalningarna från trafiken, jämfört med de totala samhällskostn	**b2**	ordered	7	0.00 %	
[Trängsel] I vilken utsträckning håller du med om att följande frågor är ett pro	**b3_1**	ordered	7	0.00 %	
[Buller] I vilken utsträckning håller du med om att följande frågor är ett probl	**b3_2**	ordered	7	0.00 %	
[Lokala luftföroreningar] I vilken utsträckning håller du med om att följande fr	**b3_3**	ordered	7	0.00 %	
[Trafikolyckor] I vilken utsträckning håller du med om att följande frågor är et	**b3_4**	ordered	7	0.00 %	
[Resekostnader] I vilken utsträckning håller du med om att följande frågor är et	**b3_5**	ordered	7	0.00 %	
[Parkering] I vilken utsträckning håller du med om att följande frågor är ett pr	**b3_6**	ordered	7	0.00 %	
[Trängsel] I vilken utsträckning håller du med om att följande frågor är ett pro	**b4_1**	ordered	7	0.00 %	
[Buller] I vilken utsträckning håller du med om att följande frågor är ett probl	**b4_2**	ordered	7	0.00 %	
[Lokala luftföroreningar] I vilken utsträckning håller du med om att följande fr	**b4_3**	ordered	7	0.00 %	
[Trafikolyckor] I vilken utsträckning håller du med om att följande frågor är et	**b4_4**	ordered	7	0.00 %	

Label	Variable	Class	# unique values	Missing	Description
[Resekostnader] I vilken utsträckning håller du med om att följande frågor är et	**b4_5**	ordered	7	0.00 %	
[Parkering] I vilken utsträckning håller du med om att följande frågor är ett pr	**b4_6**	ordered	7	0.00 %	
Det är viktigt att skattebetal-ningarna från trafiken i en ny skattereform täcker	**b5**	ordered	7	0.00 %	
Det är viktigt att skattebetal-ningarna från trafiken i en ny skattereform täcker	**b6**	ordered	7	0.00 %	
Att införa en milskatt för endast elfordon är relevant om bensin- och dieselbila	**b7**	ordered	7	0.00 %	
I vilken utsträckning håller du med om att det är viktigt att registreringen av	**b8**	ordered	7	0.00 %	
Vill du lägga till något om vägskatteform med milskatt?	**b9**	character	7	23.83 %	
Har du körkort?	**c1**	ordered	2	0.00 %	
Planerar du att ta körkort under de närmaste två åren?	**c2**	ordered	2	0.00 %	
	c3	factor	2	0.00 %	
[Bilens märke] Beskriv bilen du äger eller har tillgång till:	**c4_1**	character	80	0.00 %	
[Modell] Beskriv bilen du äger eller har tillgång till:	**c4_2**	character	181	0.00 %	
[Årsmodell] Beskriv bilen du äger eller har tillgång till:	**c4_3**	character	54	0.00 %	
[År då du köpte eller fick tillgång till bilen] Beskriv bilen du äger eller har	**c4_4**	character	50	0.00 %	

Label	Variable	Class	# unique values	Missing	Description
[Skatter (per månad)] Hur mycket kostar bilen i kronor per månad? Uppskattninga	**c5_1**	numeric	67	32.43 %	
[Försäkring (per månad)] Hur mycket kostar bilen i kronor per månad? Uppskattni	**c5_2**	numeric	74	32.43 %	
[Service och underhåll (per månad)] Hur mycket kostar bilen i kronor per månad?	**c5_3**	numeric	42	32.43 %	
[Parkering hemma (per månad)] Hur mycket kostar bilen i kronor per månad? Uppsk	**c5_4**	numeric	44	32.43 %	
[Trängselskatt (per månad)] Hur mycket kostar bilen i kronor per månad? Uppskat	**c5_5**	numeric	38	32.43 %	
[Värdeminskning (per månad)] Hur mycket kostar bilen i kronor per månad? Uppska	**c5_6**	numeric	43	32.43 %	
Hur långt kör du per år med den bil du har tillgång till (mil per år)? En uppsk	**c6**	numeric	56	32.43 %	
Går bilen på ett eller flera bränslen?	**c7**	ordered	3	32.43 %	
[Bensin] Vilka bränslen går bilen på? Upp till två alternativ kan anges.	**c8_1**	ordered	3	32.43 %	
[Diesel] Vilka bränslen går bilen på? Upp till två alternativ kan anges.	**c8_2**	ordered	3	32.43 %	
[E85] Vilka bränslen går bilen på? Upp till två alternativ kan anges.	**c8_3**	ordered	3	32.43 %	

Label	Variable	Class	# unique values	Missing	Description
[Etanol] Vilka bränslen går bilen på? Upp till två alternativ kan anges.	**c8_4**	ordered	3	32.43 %	
[El] Vilka bränslen går bilen på? Upp till två alternativ kan anges.	**c8_5**	ordered	3	32.43 %	
[Gas (t.ex. naturgas, biogas)] Vilka bränslen går bilen på? Upp till två altern	**c8_6**	ordered	3	32.43 %	
[Annat] Vilka bränslen går bilen på? Upp till två alternativ kan anges.	**c8_other**	ordered	3	32.43 %	
[Annat] Vilka bränslen går bilen på? Upp till två alternativ kan anges.	**c8_other_text**	character	3	0.00 %	
Vilken är den blandade bränsleförbrukningen för bilen (liter/mil)? En uppskattn	**c9**	character	107	0.00 %	
Hur många resor gjorde du till ditt arbete under februari i år? En ungefärlig u	**d1**	numeric	45	0.00 %	
Vilket färdsätt använde du huvudsakligen under dessa resor?	**d2**	ordered	9	0.49 %	
[Annat] Vilket färdsätt använde du huvudsakligen under dessa resor?	**d2_other_text**	character	31	0.00 %	
Hur ofta åkte du bil (som förare eller passagerare) mellan hemmet och arbetet un	**d3**	ordered	6	0.00 %	
Hur ofta reste du med kollektivtrafik mellan hemmet och arbetet under februari i	**d4**	ordered	6	0.00 %	
Hur ofta gjorde du privata resor, alltså alla andra resor än de som görs mellan	**e1**	ordered	6	0.00 %	

Label	Variable	Class	# unique values	Missing	Description
Vilket färdsätt använder du huvudsakligen under dessa resor?	**e2**	ordered	8	0.00 %	
[Annat] Vilket färdsätt använder du huvudsakligen under dessa resor?	**e2_other_text**	character	15	0.00 %	
Hur ofta åkte du bil (som förare eller passagerare) på privata resor under febru	**e3**	ordered	6	0.00 %	
Hur ofta reste du med kollektivtrafik på privata resor under februari i år?	**e4**	ordered	6	0.00 %	
	f1	numeric	14	0.00 %	
[Växter] För varje punkt nedan, ange på en skala från "Inte alls viktigt" till "	**g2_1**	ordered	7	0.00 %	
[Mig själv] För varje punkt nedan, ange på en skala från "Inte alls viktigt" til	**g2_2**	ordered	7	0.00 %	
[Djur] För varje punkt nedan, ange på en skala från "Inte alls viktigt" till "Ex	**g2_3**	ordered	7	0.00 %	
[Människor i mitt land] För varje punkt nedan, ange på en skala från "Inte alls	**g2_4**	ordered	7	0.00 %	
[Marint liv] För varje punkt nedan, ange på en skala från "Inte alls viktigt" ti	**g2_5**	ordered	7	0.00 %	
[Framtida generationer] För varje punkt nedan, ange på en skala från "Inte alls	**g2_6**	ordered	7	0.00 %	
[Min livsstil] För varje punkt nedan, ange på en skala från "Inte alls viktigt"	**g2_7**	ordered	7	0.00 %	

Label	Variable	Class	# unique values	Missing	Description
[Alla människor] För varje punkt nedan, ange på en skala från "Inte alls viktigt	**g2_8**	ordered	7	0.00 %	
[Fåglar] För varje punkt nedan, ange på en skala från "Inte alls viktigt" till "	**g2_9**	ordered	7	0.00 %	
[Min hälsa] För varje punkt nedan, ange på en skala från "Inte alls viktigt" til	**g2_10**	ordered	7	0.00 %	
[Barn] För varje punkt nedan, ange på en skala från "Inte alls viktigt" till "Ex	**g2_11**	ordered	7	0.00 %	
[Min framtid] För varje punkt nedan, ange på en skala från "Inte alls viktigt" t	**g2_12**	ordered	7	0.00 %	
Är du man eller kvinna?	**h1**	ordered	3	0.00 %	
Vilken är din ålder?	**h2**	numeric	73	0.00 %	
Vilket är ditt civilstånd?	**h3**	ordered	4	0.00 %	
Hur många barn har du som bor hemma i hushållet?	**h4**	numeric	10	0.00 %	
Vilken var din huvudsakliga sysselsättning under februari i år?	**h5**	ordered	10	0.25 %	
[Annat] Vilken var din huvudsakliga sysselsättning under februari i år?	**h5_other_text**	character	9	0.00 %	
Bor du i enfamiljshus eller flerfamiljshus?	**h6**	ordered	4	1.23 %	
[Annat] Bor du i enfamiljshus eller flerfamiljshus?	**h6_other_text**	character	17	0.00 %	
Vill du lägga till något om hur enkäten var utformad?	**i1**	character	35	21.62 %	
	keep_tax_dummy	numeric	2	0.00 %	
	reduce_subsidy_dummy	numeric	2	0.00 %	
	increase_tax_dummy	numeric	2	0.00 %	
	acceptability	numeric	13	0.00 %	
	prt	numeric	43	0.00 %	

Label	Variable	Class	# unique values	Missing	Description
	prt_threat	numeric	19	0.00 %	
	prt_anger	numeric	19	0.00 %	
	prt_cognition	numeric	25	0.00 %	
	ec_biospheric	numeric	23	0.00 %	
	ec_egoistic	numeric	25	0.00 %	
	ec_altruistic	numeric	24	0.00 %	
	ec	numeric	62	0.00 %	
	inc	factor	3	0.00 %	

Variable list

id

- The variable is a key (distinct values for each observation).

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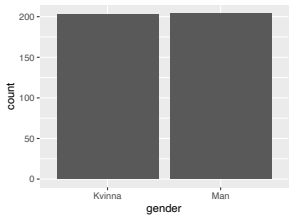
gender

Feature	Result
Variable type	factor
Number of missing obs.	0 (0 %)
Number of unique values	2
Mode	“Man”
Reference category	Kvinna



- Observed factor levels: "Kvinna", "Man".

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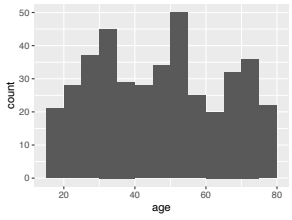
age

Ålder

Feature	Result
Variable type	numeric
Number of missing obs.	0 (0 %)
Number of unique values	63
Median	47
1st and 3rd quartiles	32; 63
Min. and max.	18; 80



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nuts2

Region

Feature	Result
Variable type	ordered
Number of missing obs.	1 (0.25 %)
Number of unique values	8
Mode	“Västsverige”
Reference category	Stockholm