

Public Opinion on Route 12

Interim report on the first survey on the pilot experiment of an automated bus service in Neuhausen am Rheinfall

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Summary

Autonomous vehicles will substantially change traffic as we know it today. The execution of test runs with autonomous vehicles offers a good opportunity to assess the public's opinion on this matter. Associated with the introduction of the autonomous Route 12 in Neuhausen am Rheinfall, the Institute of Science, Technology and Policy (ISTP) at ETH Zurich carried out a survey on the test run of Route 12 as well as autonomous driving in general, using 1,408 randomly selected participants from three municipalities of the Canton of Schaffhausen between February and April 2018. The current report describes the process of data collection and presents the results for this first of three planned surveys.

Although the participants were generally sceptical towards fully automated road traffic, trial runs such as the one in Neuhausen am Rheinfall are highly supported. Concerns regarding a general transition are spread across a variety of aspects, but primarily on the possible misuse through third parties, for example through hacking attacks, but also regarding interaction with weaker participants in traffic (cyclists and pedestrians) and the reaction in unexpected situations. A possible transfer of data from vehicles to the state, for example to the Road Traffic Department or the Swiss Federal Tax Administration is rejected by a large majority.

We found minor differences regarding certain demographic attributes. While women have fewer concerns about a general transition, they do judge possible problems such as the loss of jobs and loss of control over driving as more concerning. Participants in the age group below 40 also show significantly higher concerns regarding possible loss of jobs, but also regarding a loss of enjoyment while driving. Participants with tertiary education show significantly lower fear of potential job losses. They also show less concern regarding loss of control or enjoyment while driving.

Neuhausen am Rheinfall's population is well-informed about the test run of Route 12, mainly due to articles in the local newspaper. Additionally, the execution of the test run in Neuhausen am Rheinfall is met with support by a large majority. However, the responsible authorities need to improve on providing information regarding the communication of the background of the project implementation.

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1 Background

Autonomous vehicles¹ will substantially change road traffic within the upcoming decades. The absence of a driver and manual steering is expected to have many positive effects, for example on traffic safety or fuel consumption (Howard and Dai 2014). However, a transition to fully automated road traffic is only possible if autonomous vehicles are accepted by society. The aim of this study is to measure public support through a test trial in Neuhausen am Rheinfall. For this purpose, three surveys will be carried out in the municipalities Neuhausen am Rheinfall, Stein am Rhein and Thayngen over the course of one and a half years. The municipalities Stein am Rhein and Thayngen were selected to be comparable to Neuhausen am Rheinfall, but are also situated in sufficient geographical distance to control for potential salient differences in the perception of autonomous vehicles caused by the Route 12. This report summarises the results of the first survey, conducted between February and April 2018.

In the upcoming decades, self-driving vehicles will form a considerable proportion of Swiss road traffic (Schweizerische Eidgenossenschaft 2016). In relation to this, many major changes in traffic are to be expected that might be able to alleviate current problems such as congestion and the risk of accidents.

According to the Swiss Federal Council, intelligent mobility is a megatrend that Switzerland needs to thoroughly prepare for, for example to be prepared for the simultaneous existence of vehicles with different levels of automatization. The upcoming challenges also comprise the clarification of several societal, ethical and political aspects, so that the necessary technical requirements and frameworks can be put in place. Further, it is necessary to answer questions related to planning and conceptualisation and to start the process of amending the relevant legislation and regulatory frameworks (Bundesamt für Strassen ASTRA 2018). Thus, these open questions range from adjusting traffic laws, licensing of vehicles, regulations regarding drivers licenses and liability to data protection and accessibility of data (Schweizerische Eidgenossenschaft 2016). As a result, amendments within the road traffic law will be necessary.

All these questions are also of public interest. Since the political system of direct democracy in Switzerland allows citizens and interest groups to directly influence the political events in Switzerland, public opinion on these questions is of special interest in order to be able to implement potential changes to the law as quickly as possible (Huber, Wicki, and Bernauer 2018;

¹ In this study defined as follows: no driver is necessary. Except for when determining the destination and starting the system, no human interference is necessary.

Tsebelis 2000; Wagschal 1997; Wicki, Huber, and Bernauer 2018). However, a recently published study shows a certain level of scepticism within the Swiss public regarding the automation of Swiss road traffic. This especially applies to fully automated vehicles in stages 4 and 5² (de Haan and Erny 2017).

The automatisisation of road traffic has also already been discussed by the Swiss parliament. A postulate was submitted in 2014 in order to investigate the effects of automated driving. In response to this, the Federal Council published a report to fulfil this postulate (Schweizerische Eidgenossenschaft 2016). The Federal Council states that autonomous driving offers interesting opportunities for road and public transport, as well as opportunities and risks for resource consumption and the environment (Schweizerische Eidgenossenschaft 2016).

In Switzerland, the licensing and usage of autonomous vehicles is governed by international conventions. According to the Vienna Convention (Wiener Übereinkommen vom 8. November 1968 über den Strassenverkehr 1968), control over a vehicle must always be provided by the driver being able to override or disable the system of an automated vehicle, or different regulations are defined in international admission requirements. Thus, drivers are not relieved of their duties and responsibilities. Driver-less vehicles can only be driven in Switzerland once the necessary technical evidence is present and the international legal framework has been developed further. For test runs, special authorisation will be required until then. One of these test runs is taking place in Neuhausen am Rheinfall. In contrast to other tests in Switzerland but also internationally, the self-driving bus will be integrated into the control system of the public transport for the first time.

Previous studies on autonomous driving have mainly focused on the technical optimisation of vehicles. Specific questions regarding the community's view on autonomous driving technologies have remained mostly unanswered. Our research project thus concentrates on the public perception of autonomous driving and the introduction of an autonomous shuttle service. We investigate the support for, willingness to use as well as fears and concerns regarding the introduction of an autonomous bus service in Neuhausen am Rheinfall as well autonomous driving in general.

This report is structured as follows: initially, the second chapter will outline several background information and goals of the research project. Subsequently, the execution of as well as the response to the first survey will be detailed. Lastly, first results of the survey will be discussed, before a conclusion including several recommendations regarding the Route 12 rounds off the report.

² Meaning nearly or completely self-driving vehicles.

2 Research project

The implementation of a test trial for a self-driving shuttle bus contains societal as well as political challenges, but also enables the investigation of unanswered questions. If, and in what form this test trial will be converted into a first- and last-mile-concept and potentially expanded to further locations³ depends partly on the development of public opinion on the matter. In order to determine the baseline of this opinion, our research team at the Institute of Science, Technology and Policy (ISTP) at ETH Zurich⁴ questioned 1,408 randomly selected participants over 18 living in the municipalities Neuhausen am Rheinfall, Stein am Rhein and Thayngen in the canton Schaffhausen between the 27th February and 28th April 2018 in a first survey.

The research project is carried out in the context of the introduction of Route 12 in Neuhausen am Rheinfall. The project is executed in collaboration with Trapeze Switzerland, Wirtschaftsförderung Schaffhausen, Verkehrsbetriebe Schaffhausen VBSH and Regionale Verkehrsbetriebe Schaffhausen RVSH AG. The goal is to determine the public perception of the autonomous shuttle bus in Neuhausen am Rheinfall at three different points in time.

2.1 Research aim

The public's attitude towards and trust in technology has proven to be a pioneer in the process of building support regarding technological innovations (Venkatesh, Thong, and Xu 2012). Building up on these findings, the following research question should thus be investigated:

How are the Route 12 in Neuhausen am Rheinfall as well as, by association, autonomous driving in general perceived by the community?

The research results lead to important insights relevant to politics. Positive effects are expected due to the automatization of road traffic and the associated removal of the human error rate. In order for these effects to occur, it is important that autonomous vehicles are accepted by the society. Trust in as well as the attitude towards technology are central to the process of building support. Research into these attitudes thus assist in increasing support, for example through providing information on the topic beforehand. The survey also enabled us to collect feedback regarding the autonomous shuttle service.

2.2 Municipalities where the research took place

Our surveys are carried out in the three municipalities Neuhausen am Rheinfall, Stein am Rhein and Thayngen. Neuhausen am Rheinfall is directly involved in the introduction of Route

³ See <https://www.swisstransitlab.com/de/linie-12>

⁴ <https://istp.ethz.ch/research/mobility.html>

12. Stein am Rhein and Thayngen serve as control groups. This enables us to gather relative changes in the perception of autonomous driving.

The three municipalities are all situated within the Canton of Schaffhausen. Compared to Neuhausen am Rheinflall, Stein am Rhein only has a third of the population. The proportion of foreign residents is highest in Neuhausen am Rheinflall with approximately 40%, while Stein am Rhein and Thayngen have around half this rate at just over 20%. The age distribution is similar in all three municipalities. However, Stein am Rhein has the highest proportion of residents over 65 years at a share of 24%, while in the other two municipalities, this share is around 20% (Bundesamt für Statistik BFS 2018).

Stein am Rhein and Thayngen were chosen as control groups in order to ensure a close comparability with Neuhausen am Rheinflall, while at the same time also guaranteeing enough geographical distance. However, this geographical distance could be decreased through commuting to work. Most of the residents in the investigated municipalities work in other places. However, they mainly commute to the city Schaffhausen and the Canton of Zürich. Commuter routes between the investigated municipalities are rare, which thus decreases possible spillover (Bundesamt für Statistik 2015).

2.3 Research plan

We are planning a panel interview in three municipalities within the Canton of Schaffhausen. The panel will consist of three waves of surveys. The first survey was carried out before the introduction of Route 12 in Neuhausen am Rheinflall. The other two surveys will be carried out six months and one year after the start of the shuttle services. For the first survey in Neuhausen am Rheinflall as well as the control groups in Stein am Rhein and Thayngen, a total of 8,000 people were contacted, in order to collect at least 1,000 complete sets of answers at the end of the panel interviews across the three waves of the survey. After each of the waves, an interim report will be created. Table 1 summarises the timeline of the study.

Table 1: Timeline

	Year	2018												2019											
		Month	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12
Project start																									
Survey wave 1																									
Data analysis and report wave 1																									
Survey wave 2																									
Data analysis and report wave 2																									
Survey wave 3																									
Data analysis																									
Final report																									

The method for data collection was based on previous surveys by our team. For example, a similar procedure was used during a field experiment in late 2016 / early 2017 investigating the CO₂ compensation behaviour of car owners in the Canton of Zürich. In this study, the Road

Traffic Department was asked to take a random sample of car owners and to provide us with their addresses, after which they were invited via post to take part in an online survey (Huber, Anderson, and Bernauer 2018).

Another survey carried out in the summer of 2017 took a similar approach. A random sample of 12,000 addresses was drawn by the Statistical Office of the Canton of Zürich. Access to the first online survey was sent via postal letter with a written reminder to the participants who had not yet completed the survey two weeks later. At the end of the survey, participants were invited to a follow-up survey. The invitation to this second part was sent out in several waves, depending on when the participants completed the first survey. Two weeks later, a reminder was again sent by post (Guidon et al. 2017; Wicki et al. 2018).

3 Survey wave 1

In February of 2018, we sent out an invitation to participate in an online survey to 8,000 residents of the three municipalities Neuhausen am Rheinfall, Stein am Rhein and Thayngen in the canton Schaffhausen. The recipients were drawn randomly from the register of residents of the three municipalities Neuhausen am Rheinfall, Stein am Rhein and Thayngen. All participants were aged 18 or older.

3.1 Survey procedure

Data were collected through an online panel survey. Invitations to participate in the online survey were sent out via postal letter. When requested, a printed version of the survey was dispatched. The survey was supposed to take around 15 minutes to complete. Ten days after the first invitation, reminder letters were sent out to those people who had not yet completed the survey and had also not informed us that they did not wish to do so. For sending these invitations and reminders, we received the following information from the respective municipality: gender, name, surname, address, municipality, post code and age. These data will be irrevocably deleted after the completion of the study in line with the research ethics at ETH Zurich (EK 2018-N-01).

3.2 Survey materials

The survey questionnaire consists of a number of questions regarding opinion on and agreement with the project Route 12. Further, we focus on concerns about but also expectations of autonomous driving in general. For example, the safety of vehicles and systems, system performance in bad weather conditions, interaction with pedestrians and cyclists, the loss of jobs through automatization and the lack of control through the driver. The reason that we focus on the risks is because individuals tend to weigh losses more heavily than gains. Thus, individuals will behave risk-aversely in situations containing uncertainties and therefore irrationally

(Thaler et al. 1997; Tversky and Kahneman 1991). This also results in politicians who are associated with uncertain risks generally being rejected by the public.

Further we asked questions concerning sociodemographics, mobility behaviour, general political orientation and ideology, technological knowledge, general attitudes towards technology, perceptions of autonomous driving, preference for autonomous driving scenarios, and perception of implementation of as well as feedback on the autonomous shuttle service as well as several socio-psychological topics. At the end of this first part, we invited participants to take part in the second part of the survey.

For most questions, answering was not mandatory. When questions were skipped we reminded participants that not all questions on the relevant page had been answered and asked them if they really wished to continue.

The standard sociodemographic questions are based generally on the traffic micro-census (Bundesamt für Statistik (BFS) and Bundesamt für Raumplanung 2017). The questions regarding availability and usage of mobility tools contained selected questions from the traffic micro-census, a survey of vehicle owners in the Canton of Zürich (Huber, Anderson, and Bernauer 2018), as well as regarding mobility and social networks in the Canton of Zürich (Guidon et al. 2018; Wicki et al. 2018).

3.3 Responses

Table 2 shows the response rate and number of responses for the online and paper versions as well as the general number of respondents for the first survey. Due to the origin of the addresses from the municipalities and the resulting high quality, the contact quota (contact quota 3) for the first survey was as high as expected at 97.9%. 2.7% of contacted people actively declined to participate (refusal rate 3). The response rate for the first survey was 17.6% (response rate 1), or 17.9% when taking into account partial responses (response rate 2). The cooperation rate was 18.0% (cooperation rate 1), or 18.3% (cooperation rate 2). Generally, the response rate was higher for the paper version. This is not surprising, seeing as those participants had actively asked for a paper version of the survey and thus already showed interest in participating. Compared to other studies, the response rate lies within an expected range (Axhausen and Weis 2010) and is thus more representative compared to surveys without random sampling (Dutwin and Buskirk 2017). Additionally, this method allows us to control for potential distortions due to sociodemographic factors.

Table 2: Responses, response rates and scope of random sample^a

	First Survey		
	Online	Paper	Total
Complete responses {I}	1306	102	1408
Partial Responses {P}	23	2	25
Refusal and dropout {R}	213	0	213
Not contacted {NC}	168	0	168
Other {O}	6174	12	6186
Used sample {TS}	7884	116 ^b	8000
Response rate 1 {I/TS}	0.166	0.879	0.176
Response rate 2 {(I+P)/TS}	0.169	0.897	0.179
Cooperation rate 1 {I/(TS-NC)}	0.169	0.879	0.180
Cooperation rate 2 {(I+P)/(TS-NC)}	0.172	0.897	0.183
Cooperation rate 3 {I/(I+P+R)}	0.847	0.981	0.855
Cooperation rate 4 {(I+P)/(I+P+R)}	0.862	1.000	0.871
Refusal rate 3 {R/TS}	0.027	0.000	0.027
Contact quota 3 {(TS-NC)/TS}	0.979	1.000	0.979

^a The numbers correspond to a response rate, cooperation rate, refusal rate and contact quota defined by the American Association for Public Opinion Research (The American Association for Public Opinion Research 2016).

^b Corresponds to the number of people who requested and received a paper version of the survey.

Figure 1 shows the stages of the first survey. Firstly, we contacted a random sample of 8,000 residents of the three municipalities Neuhausen am Rheinfall, Stein am Rhein and Thayngen in the Canton of Schaffhausen. Of this originally contacted sample, 168 people were not contacted or were not available due to reasons such as illness. Of the remaining sample, 154 did not consent on the consent form within the survey or contacted us to confirm that they were not taking part. Of the remaining people invited via letter, 1,537 began the survey, 1,408 completed it. 150 participants completed the survey partially. At the end of the survey, participants were asked whether they would like to participate in two further surveys. 1,142 participants consented to this and will be invited to the first of two follow-up surveys via letter in autumn 2018.

Figure 1: Survey stages and participation

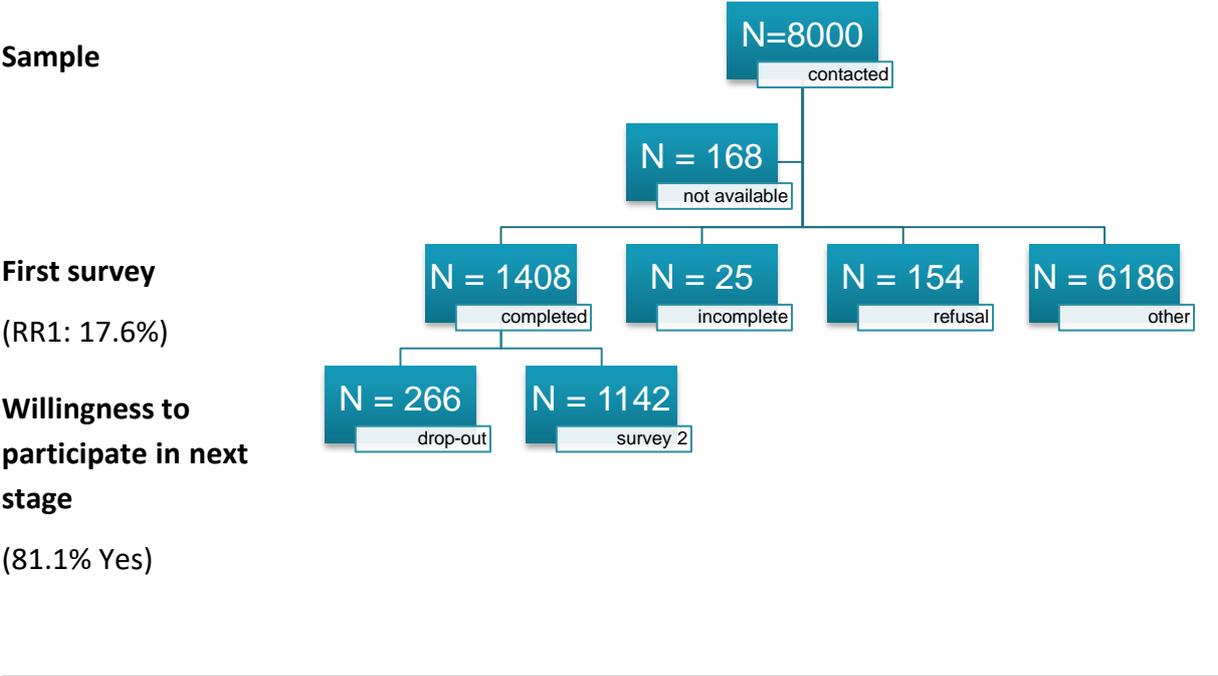


Figure 2 shows the distribution of response time in minutes. The median was 16.9 minutes. Partial responses and participants who did not consent on the consent form at the beginning of the survey are excluded. The graph only includes response times below 100 minutes.

Figure 2: Distribution of response time in minutes

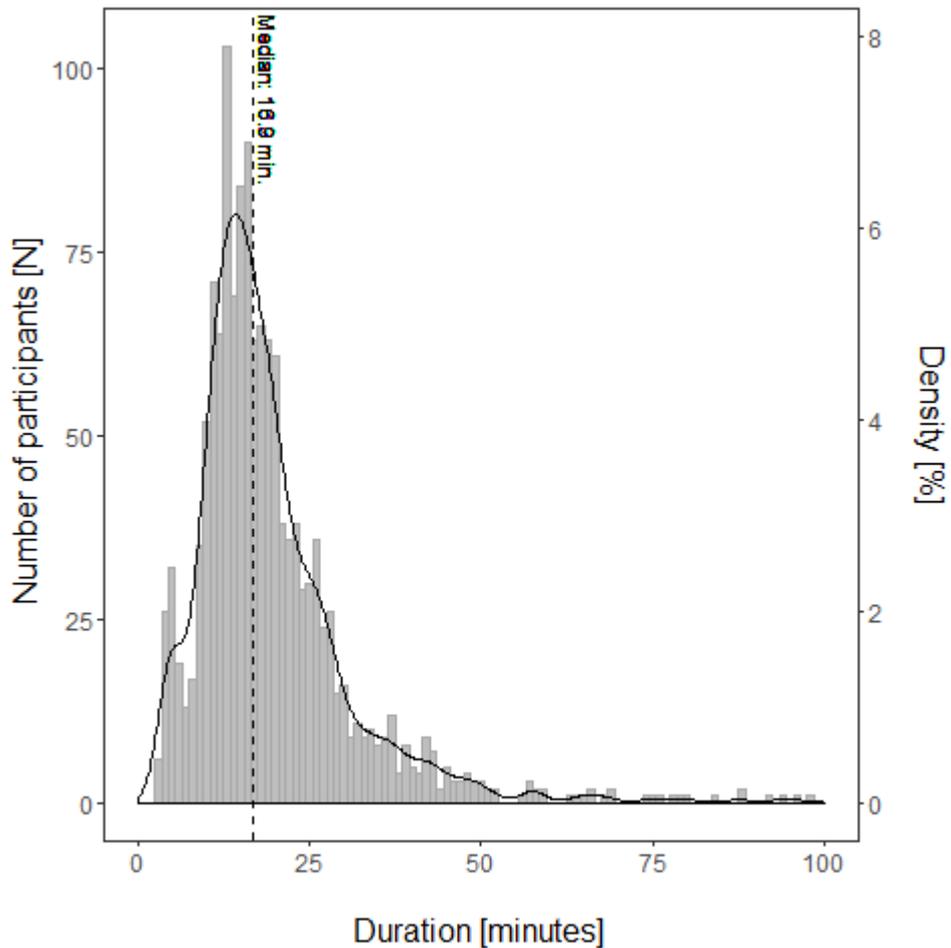
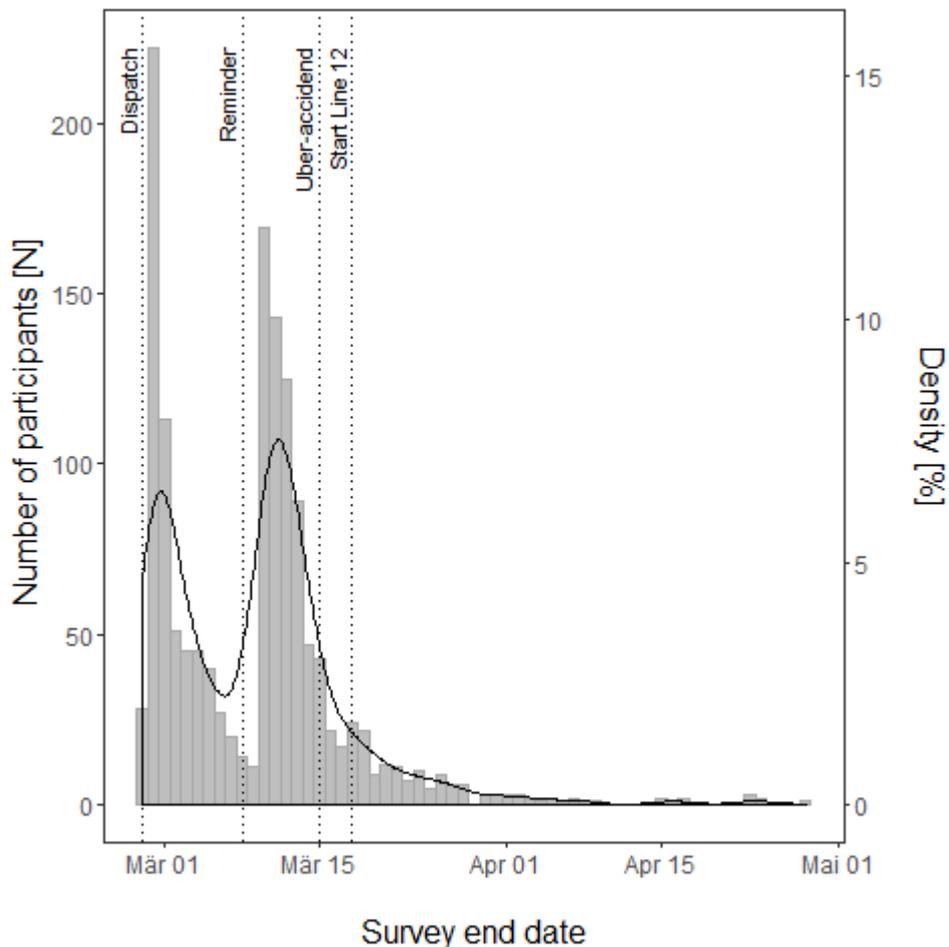


Figure 3 provides an overview over when the questions for the first part of the survey were answered by the participants. The dashed lines show the dispatch of the invitation as well as reminder letters, as well as of the fatal Uber-accident with a self-driving vehicle in March 2018, which thus fell within the time period of this survey (Griggs and Wakabayashi 2018). It is noticeable that the majority of answers were already submitted before this accident. Thus, only few responses should have been influenced by this event. The fourth line marks the introduction of Route 12 and thus shows those surveys that were only filled out afterwards.

Figure 3: Distribution of survey completions by date



3.4 Sample

Participants were aged between 18 and 92 with a mean age of 54.6 years. 58.8% were male, 42.2% female. Table 3 offers an overview of the distribution across municipalities and in comparison with the cantonal statistics. This shows that men are slightly over-represented in our survey. The level of education included about 25% academics who had either graduated from a college or university. At the same time, around 40% of participants stated a vocational college degree or apprenticeship as their highest level of education. A further 20% additionally possess a higher vocational or educational degree.

Additionally, the household income of participants was assessed. Around 65% of participants stated having more than CHF 6,000 per month at their disposal. Around 40% stated that they were currently employed. Many pensioners participated in the survey, accounting for around 25% of overall responses. Due to the demographic age structure of the three municipalities, this is not surprising, however.

92.1% of participants stated they had a driving license. Around 70% of people with a license own their own car. On average, they drive 12,800km per year with a car. Only 1.5% of participants stated being unable to access a car. 53% of participants also own a season ticket for public transport – approximately 60% stated that this was a half-fare season ticket.

Table 3 shows the representativeness of our sample. It can be seen that in comparison, mostly people from Stein am Rhein completed our survey, followed by Thayngen and lastly Neuhausen am Rheinfall. Compared to the municipality statistics, more men and more old persons completed the survey. This means that the group of 65-79 year olds is over-represented compared to the official statistics.

Table 3: Socio-demographics of the municipalities 2016 (Bundesamt für Statistik BFS 2018)

	Neuhausen am Rheinfall		Thayngen		Stein am Rhein	
	Cantonal Statistics	Participants	Cantonal Statistics	Participants	Cantonal Statistics	Participants
<i>Population</i>	10'407	622	5'422	440	3'421	343
<i>Gender</i>						
Male	49.8%	59.0%	NA	57.6%	48.6%	59.8%
Female	50.1%	41.0%	NA	42.4%	51.4%	40.2%
<i>Age</i>						
0-19	18.6%	2.1%	19.8%	0.9%	16.4%	0.6%
20-64	60.1%	65.6%	59.5%	74.8%	57.8%	60.9%
65-79	14.6%	25.7%	14.8%	20.9%	19.0%	32.1%
80+	6.8%	6.6%	5.9%	3.4%	6.8%	3.4%

Table 4 shows the participation choice model of our full sample for the first survey. It compares people who participated in the first survey with the rest of the total sample that did not participate. In order to do this, a binary logistic regression model was estimated to assess the impact of socioeconomic factors on actual participation behaviour. It can be observed that male as well as older individuals were comparatively less likely to participate than people from the two control municipalities Thayngen and Stein am Rhein. The participants in our survey

are thus not completely representative of the general population, which needs to be considered in future analysis, for example by controlling for sociodemographic factors.

Table 4: Participation choice model

	<i>Participation in the survey</i>
Men	0.440*** (0.060)
Municipality ¹ Stein am Rhein	0.350*** (0.076)
Thayngen	0.162** (0.069)
Age	0.086*** (0.010)
Age x Age	-0.001*** (0.0001)
Constant	-4.268*** (0.259)
Observations	8,000
Log Likelihood	-3,622.618
Akaike Inf. Crit.	7,257.236

Note: *p<0.1; **p<0.05; ***p<0.01

Reference category: ¹Neuhausen am Rheinfall

4 Results

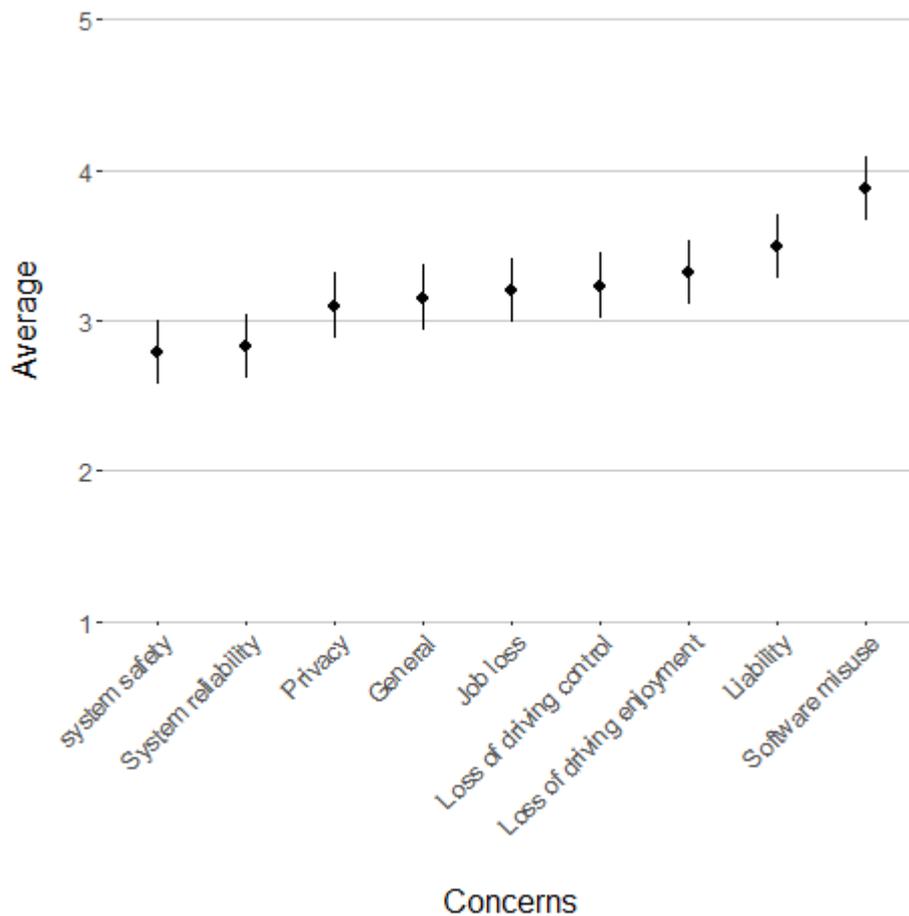
The following chapter details initial results from the first survey. To begin with, we will discuss questions relating to the general attitude towards autonomous driving. Afterwards, we will discuss insights regarding the pilot study for Route 12 in Neuhausen am Rheinfall.

4.1 Attitude towards autonomous driving in general

Figure 4 shows to what extent the survey participants agreed or disagreed with the listed concerns regarding autonomous driving. In order to do this, participants were asked to rate their concern relating to specific statements about the comprehensive introduction of autonomous cars and buses. This shows that concerns about system security and reliability are on average

least prevalent and are usually disagreed with. General concerns, privacy, loss of jobs as well as a loss of driving control and driving enjoyment receive an average of three points of agreement on a scale of 1 to 5. The uncertainty regarding liability in case of an accident on average received slightly higher but not statistically significantly different agreement. However, the biggest concerns appeared in regards to the misuse of software and possible hacking attacks.

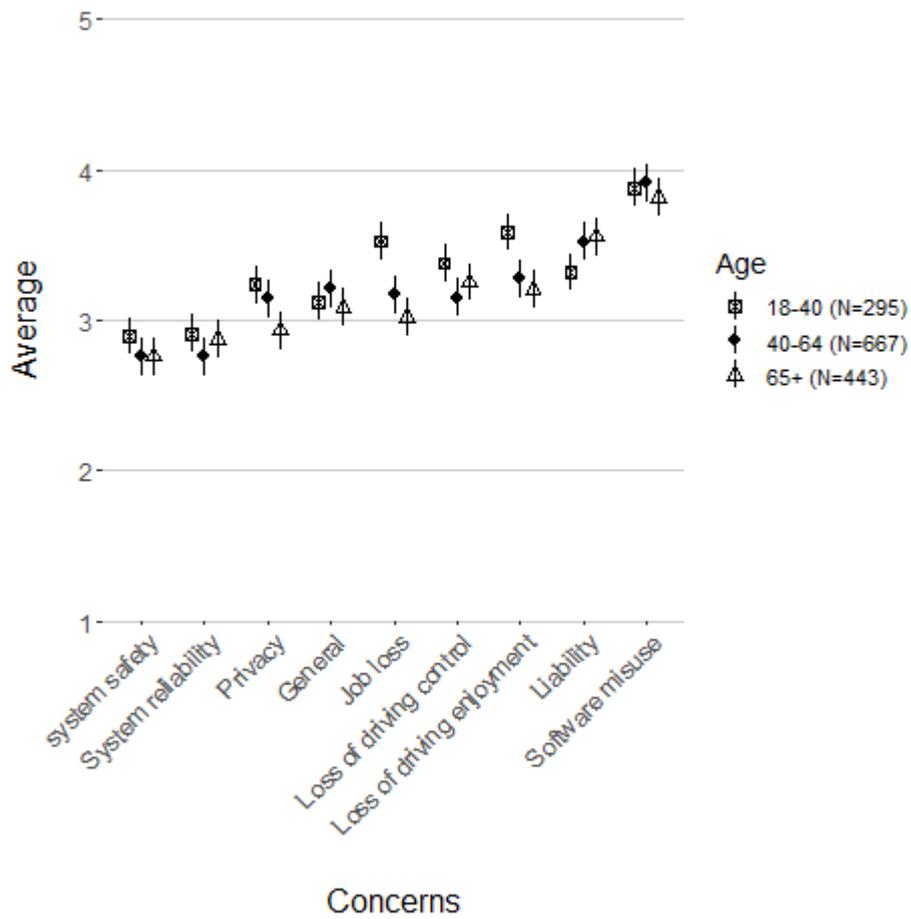
Figure 4: Concerns regarding autonomous driving (N=1408)



Note: The points represent the mean of all answers to the question «How much do you agree or disagree with the following statements? The idea that autonomous cars and buses will be introduced throughout the country worries me, because...» on a scale of 1 (strongly disagree) to 5 (strongly agree). The ranges represent the confidence intervals of the replies and thus the statistical margin of error. If the confidence intervals of two replies do not overlap, the means for those replies are statistically different. The wording of questions has been abbreviated to assist readability. The exact wording of questions can be found in Appendix A1.

When separating the responses in Figure 4 by age, a slightly different result can be found. Figure 5 shows that the age group 18-40 on average had more concerns regarding the loss of jobs as well as the loss of driving control and enjoyment. By contrast, people in the age group above 65 have fewer concerns regarding the protection of privacy.

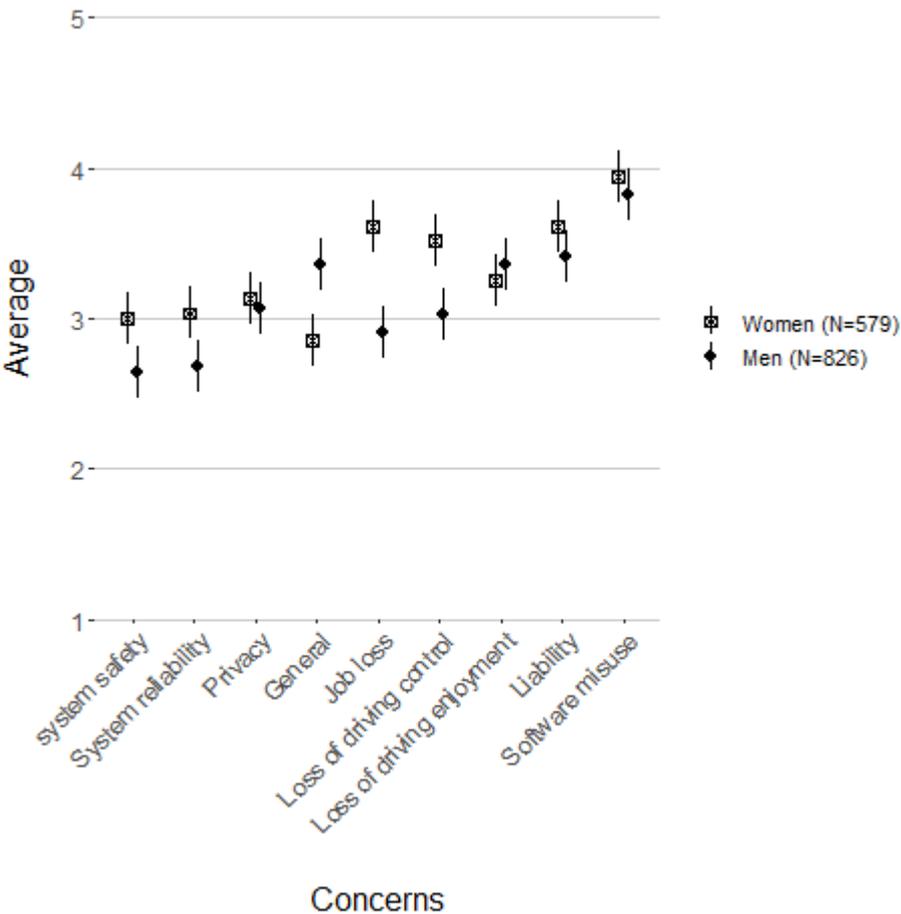
Figure 5: Concerns regarding autonomous driving by age



Note: The points represent the mean of all answers to the question «How much do you agree or disagree with the following statements? The idea that autonomous cars and buses will be introduced throughout the country worries me, because...» on a scale of 1 (strongly disagree) to 5 (strongly agree). The ranges represent the confidence intervals of the replies and thus the statistical margin of error. If the confidence intervals of two replies do not overlap, the means for those replies are statistically different. The wording of questions has been abbreviated to assist readability. The exact wording of questions can be found in Appendix A1.

Figure 6 shows the difference in concerns by gender. Women generally voice fewer concerns regarding a transition of road traffic towards autonomous cars and buses. However, they have higher concerns regarding specific topics such as possible job loss. Generally, men also seem to display higher trust in technology: they voiced significantly less concern regarding system security and reliability, but also regarding the loss of driving control.

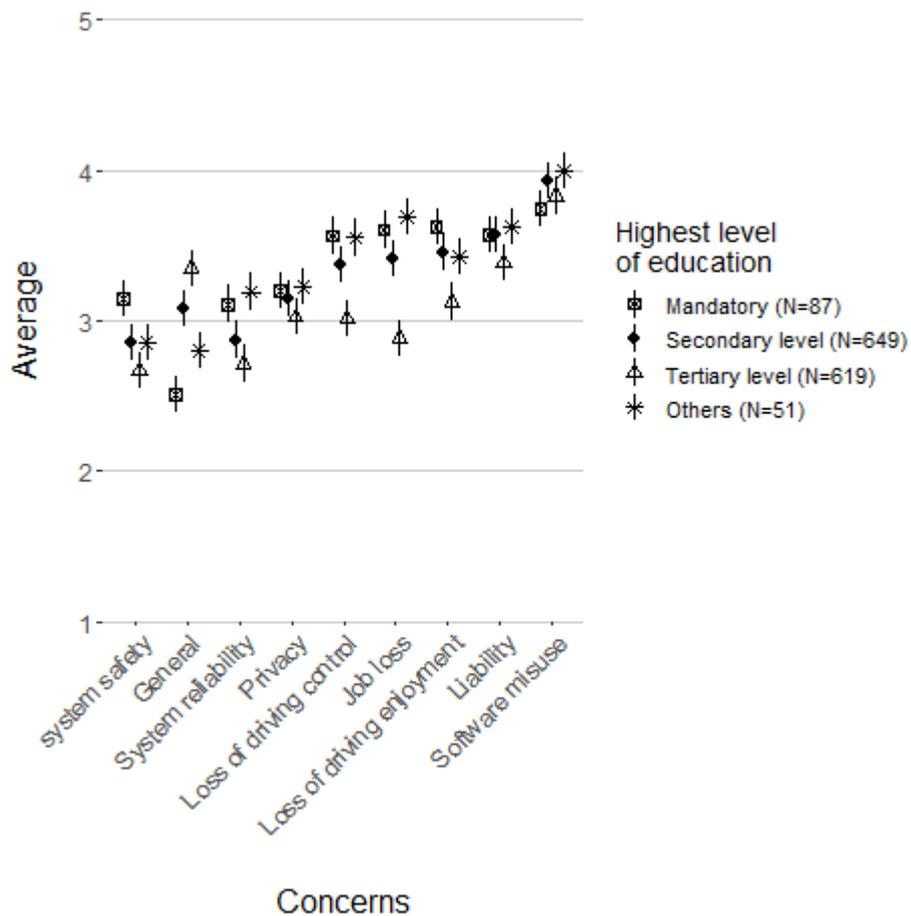
Figure 6: Concerns regarding autonomous driving by gender



Note: The points represent the mean of all answers to the question «How much do you agree or disagree with the following statements? The idea that autonomous cars and buses will be introduced throughout the country worries me, because...» on a scale of 1 (strongly disagree) to 5 (strongly agree). The ranges represent the confidence intervals of the replies and thus the statistical margin of error. If the confidence intervals of two replies do not overlap, the means for those replies are statistically different. The wording of questions has been abbreviated to assist readability. The exact wording of questions can be found in Appendix A1.

Figure 7 shows the concerns by highest completed level of education. While people with a higher level of education generally had significantly more concerns, people with tertiary education had significantly fewer concerns regarding the loss of driving control and enjoyment. They also had significantly fewer concerns regarding a potential loss of jobs.

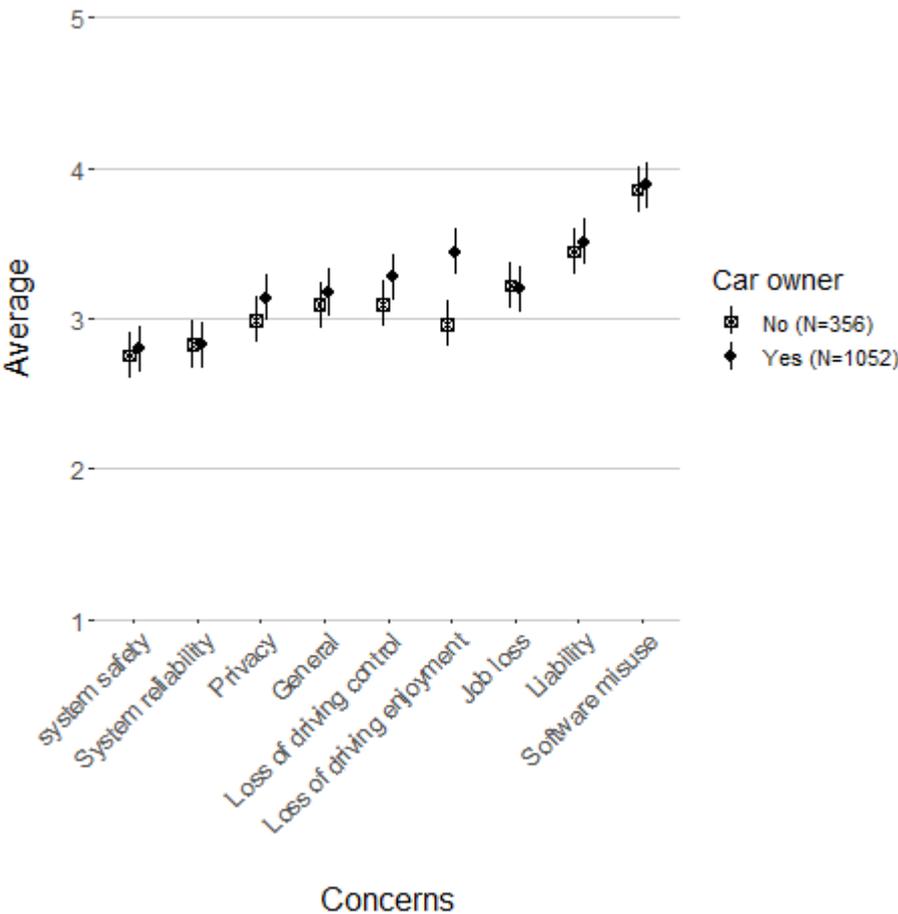
Figure 7: Concerns regarding autonomous driving by highest completed level of education



Note: The points represent the mean of all answers to the question «How much do you agree or disagree with the following statements? The idea that autonomous cars and buses will be introduced throughout the country worries me, because...» on a scale of 1 (strongly disagree) to 5 (strongly agree). The ranges represent the confidence intervals of the replies and thus the statistical margin of error. If the confidence intervals of two replies do not overlap, the means for those replies are statistically different. The wording of questions has been abbreviated to assist readability. The exact wording of questions can be found in Appendix A1.

When concerns are broken down by car ownership, barely any differences are recognisable. As shown in Figure 8, a difference is only visible for loss of driving enjoyment. This is not surprising, as people without cars or even without a driving license will experiences comparatively fewer changes regarding this in the case of a general transition towards autonomous driving.

Figure 8: Concerns regarding autonomous driving by car ownership



Note: The points represent the mean of all answers to the question «How much do you agree or disagree with the following statements? The idea that autonomous cars and buses will be introduced throughout the country worries me, because...» on a scale of 1 (strongly disagree) to 5 (strongly agree). The ranges represent the confidence intervals of the replies and thus the statistical margin of error. If the confidence intervals of two replies do not overlap, the means for those replies are statistically different. The wording of questions has been abbreviated to assist readability. The exact wording of questions can be found in Appendix A1.

Figure 9 shows concerns regarding autonomous driving in an every-day context. As shown, especially uncertain situations but also interactions of autonomous vehicles with pedestrians and cyclists are a cause for concern. However, the concern that autonomous vehicles might even drive worse than humans does not seem to be widely agreed with. Opinions regarding the behaviour of autonomous vehicles in bad weather conditions as well as their interaction with non-autonomous vehicles are more diversified.

Figure 9: How concerned or not concerned are you about the below listed statements regarding autonomous vehicles? (N=1392)

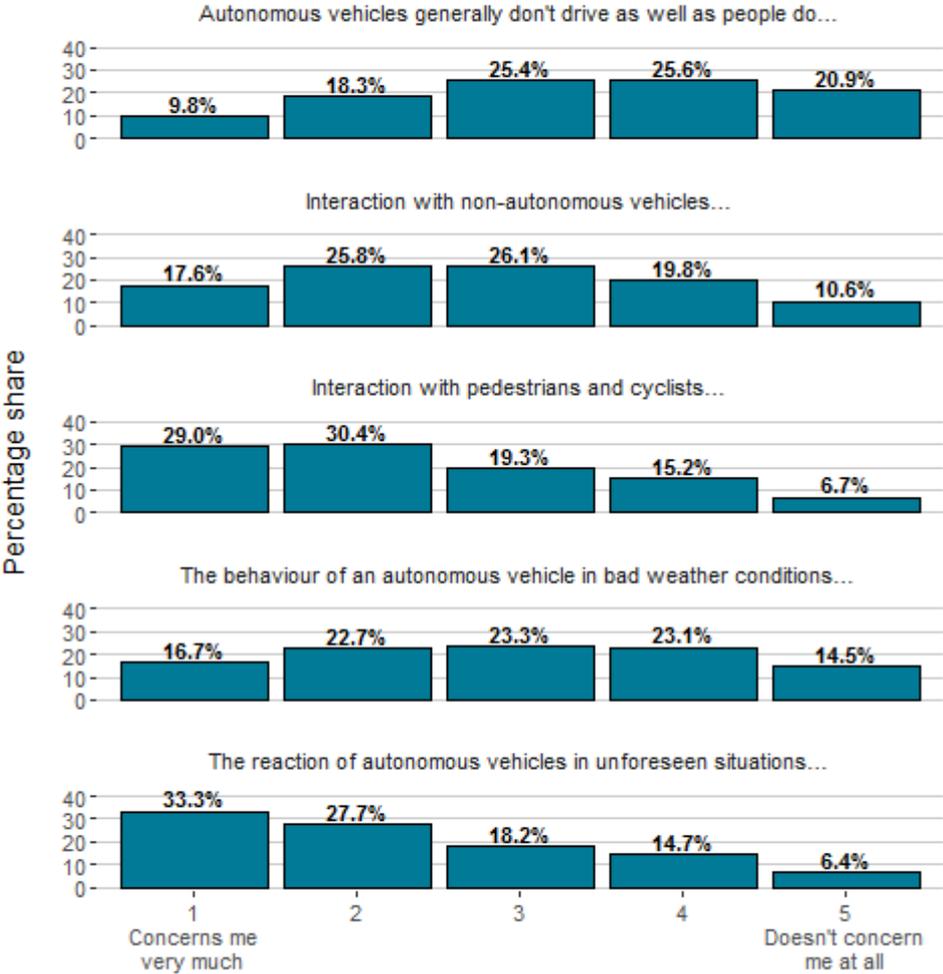
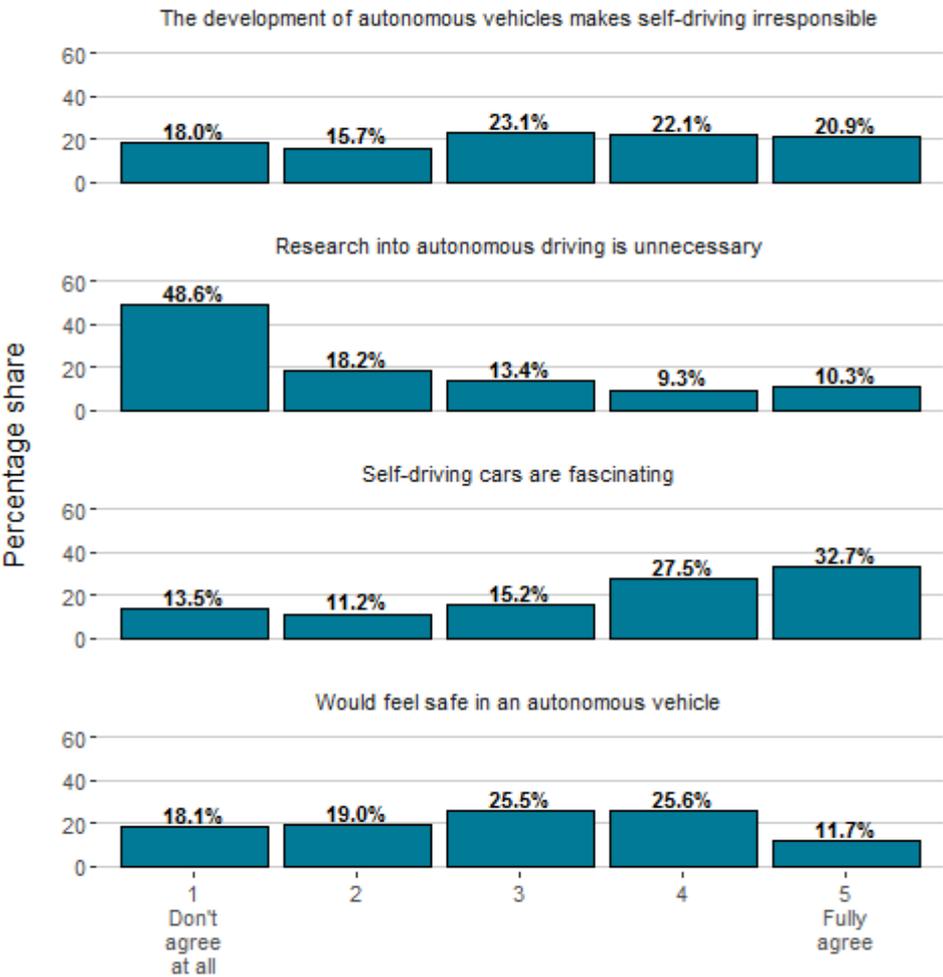


Figure 10 summarises general attitudes towards the topic of autonomous vehicles. A majority is fascinated by the notion that cars might drive by themselves. Thus, a majority also disagrees with the statement that research into autonomous driving is pointless. Opinions regarding the question of whether driving manually could become irresponsible regarding the development of autonomous vehicles and the resulting increased security in traffic are slightly more differentiated. Opinions on this are generally balanced, although a slight majority agrees with this statement. The responses to concerns regarding safety can be interpreted as follows: even though the majority of participants tends to agree that they feel safe, the option to strongly agree with this statement was rarely chosen. This shows that there remain some unanswered questions and thus further concerns need to be cleared up.

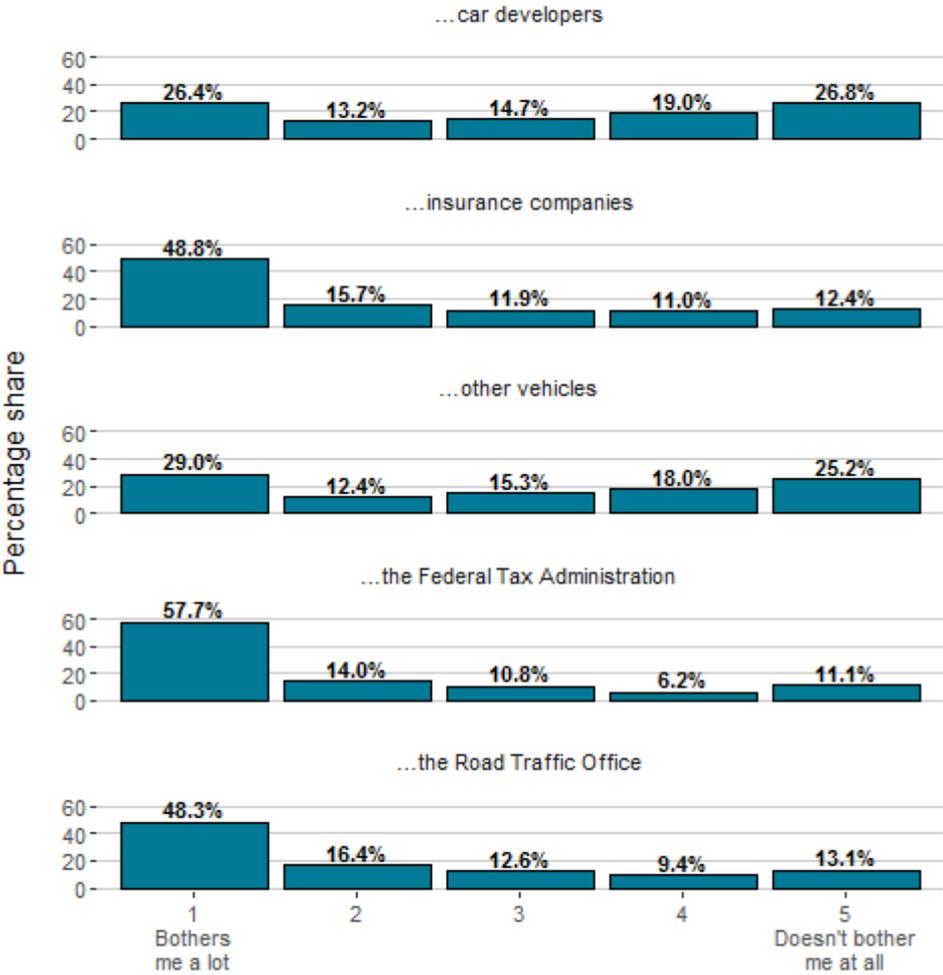
Figure 10: Attitudes towards autonomous vehicles (N=1404)



Note: Responses to the question « How much do you agree or disagree with the following statements?»

Figure 11 shows to what extent it would bother participants if their car transmitted information to various third parties. The results indicate that participants have different opinions on the transmission of information to developers and other vehicles. Around a quarter of participants would object very much to such data transfers, while just as many people would not have any problems with it. This is different regarding the transmission of information to insurance companies and the Road Traffic Department. 50% of participants would object strongly to this. Even more marked is this result for a possible transfer of data to the Swiss Federal Tax Administration

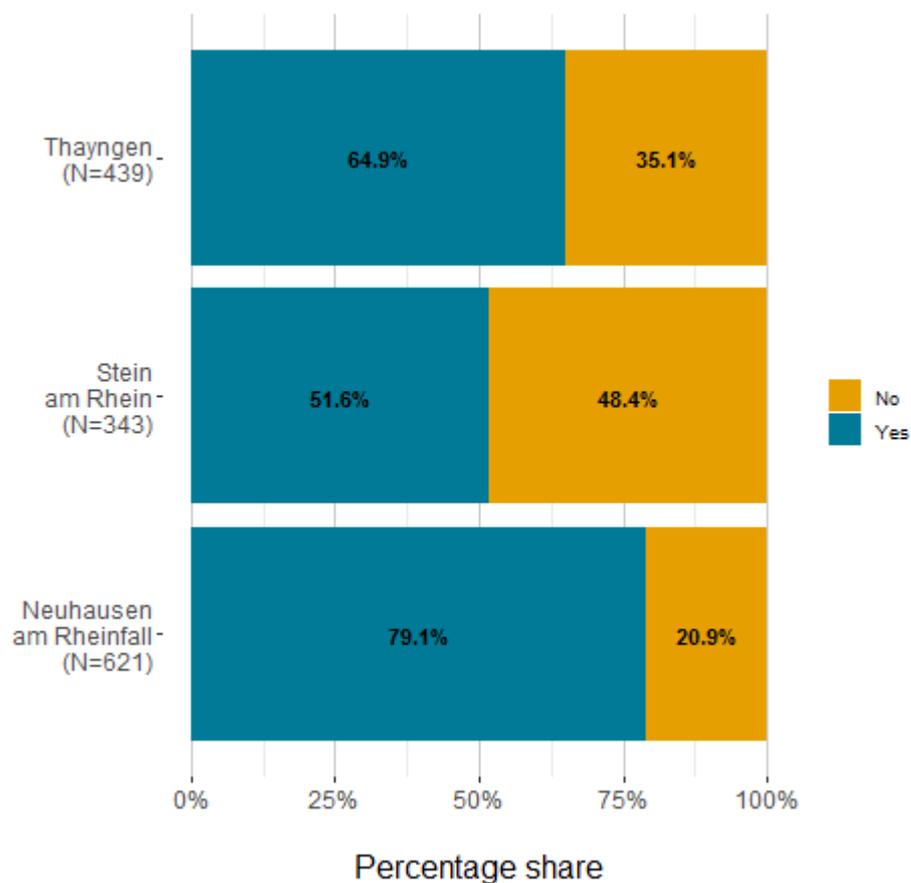
Figure 11: Would it bother you or not bother you if your car passes on information about position and driving behaviour to...? (N=1392)



4.2 Status of information

Regarding the test trial in Neuhausen am Rheinflall, the popularity of Route 12 is interesting to begin with. Figure 12 shows knowledge about the trials broken down into the three municipalities. Generally, knowledge about the test run is very high at 70%. Unsurprisingly, Neuhausen am Rheinflall residents have the highest knowledge at 80%. People in Stein am Rhein are the least informed about the test, which could be explained by the biggest geographical distance from the test trial of Route 12 among the three municipalities.

Figure 12: Knowledge about the scheduled test run by municipality



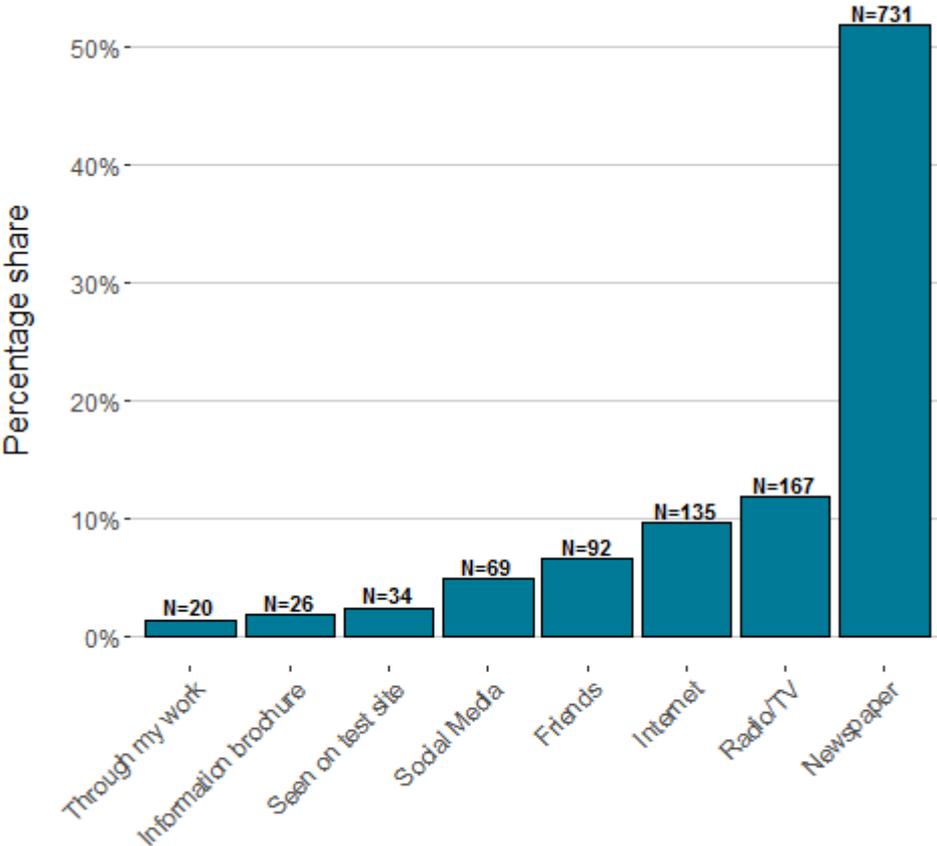
Note: Knowledge about the test run was coded «yes» if the participants could answer both the question « Do you know whether tests with autonomous cars or buses are planned or already taking place in the Canton of Schaffhausen?» with “Yes”, as well as the question “In which municipality in the Canton of Schaffhausen do you think such tests with autonomous cars or buses are taking place?” with „Neuhausen am Rheinflall“. All other participants were coded as “No”.

When asked a direct question regarding this topic (e.g. «Have you heard about a test trial for a self-driving bus in Neuhausen am Rheinflall?»), many participants who had not heard of it would possibly still reply «yes» as they would perceive this as the socially desirable response.

We thus used a type of question to which responses related to social desirability could be mostly avoided. First, participants were asked where they believe that a test run for an autonomous bus was currently happening in the Canton of Schaffhausen. Subsequently, they were then asked about the municipality in which they believe this test run to be taking place. For people who answered “Neuhausen am Rheinfall”, it can be assumed that they are informed about the trial.

Questions about the test trial in Neuhausen am Rheinfall were subsequently only posed to those people who knew about it. Figure 13 shows how participants became aware of the test run. This clearly shows that the media coverage, with 731 people especially in the newspapers, acts as the primary source of information. Slightly fewer people knew about the test trial through the internet or social media, or through acquaintances and friends. A small amount of people came into contact with the test at work (working for Trapeze or the Schaffhausen transport enterprises) or have seen the bus on the testing ground in Neuhausen am Rheinfall. Not many people noticed the informative brochure about the test trial. Only 26 participants named it as a source of information.

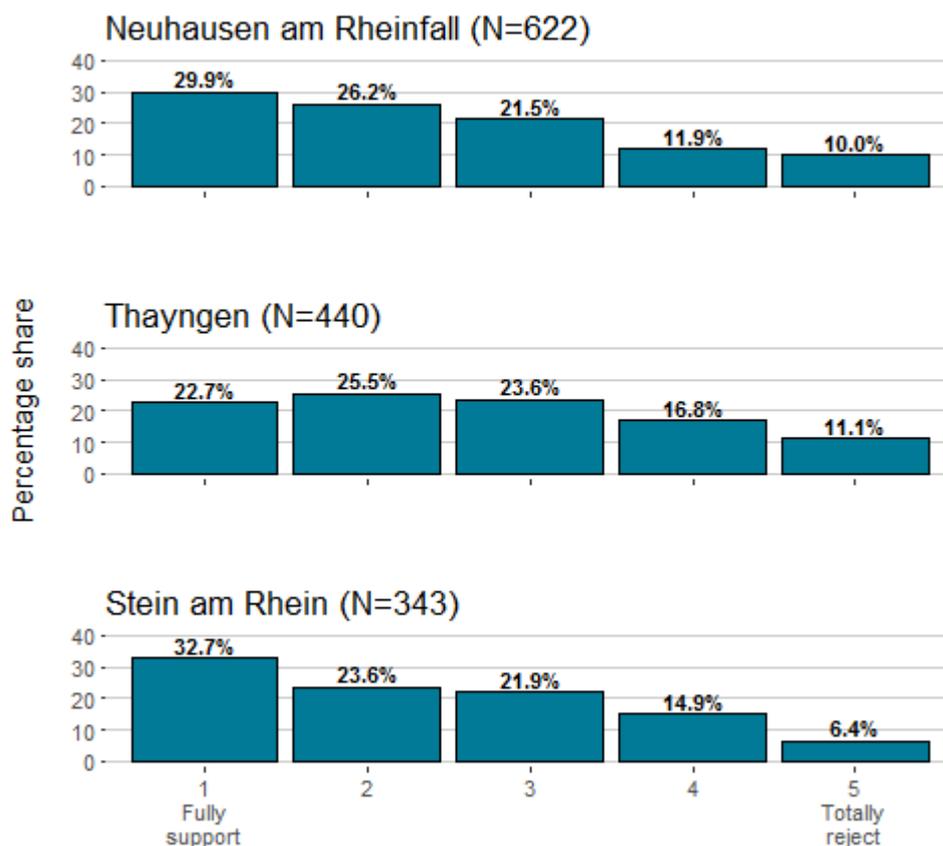
Figure 13: How did you find out about the autonomous bus test in Neuhausen am Rheinfall? (multiple response)



4.3 Agreement with the test run Route 12

In Switzerland, there have been several test trials with self-driving vehicles. Figure 14 shows whether the participants in the three municipalities agree with those. Generally it can be said that a strong majority agrees with such tests. On average, however, people from Thayngen tend to be a bit more critical, and „fully support“ such test runs about 20% less than people from Neuhausen am Rheinfall and Stein am Rhein, where around 30% of participants fully agree with such test runs.

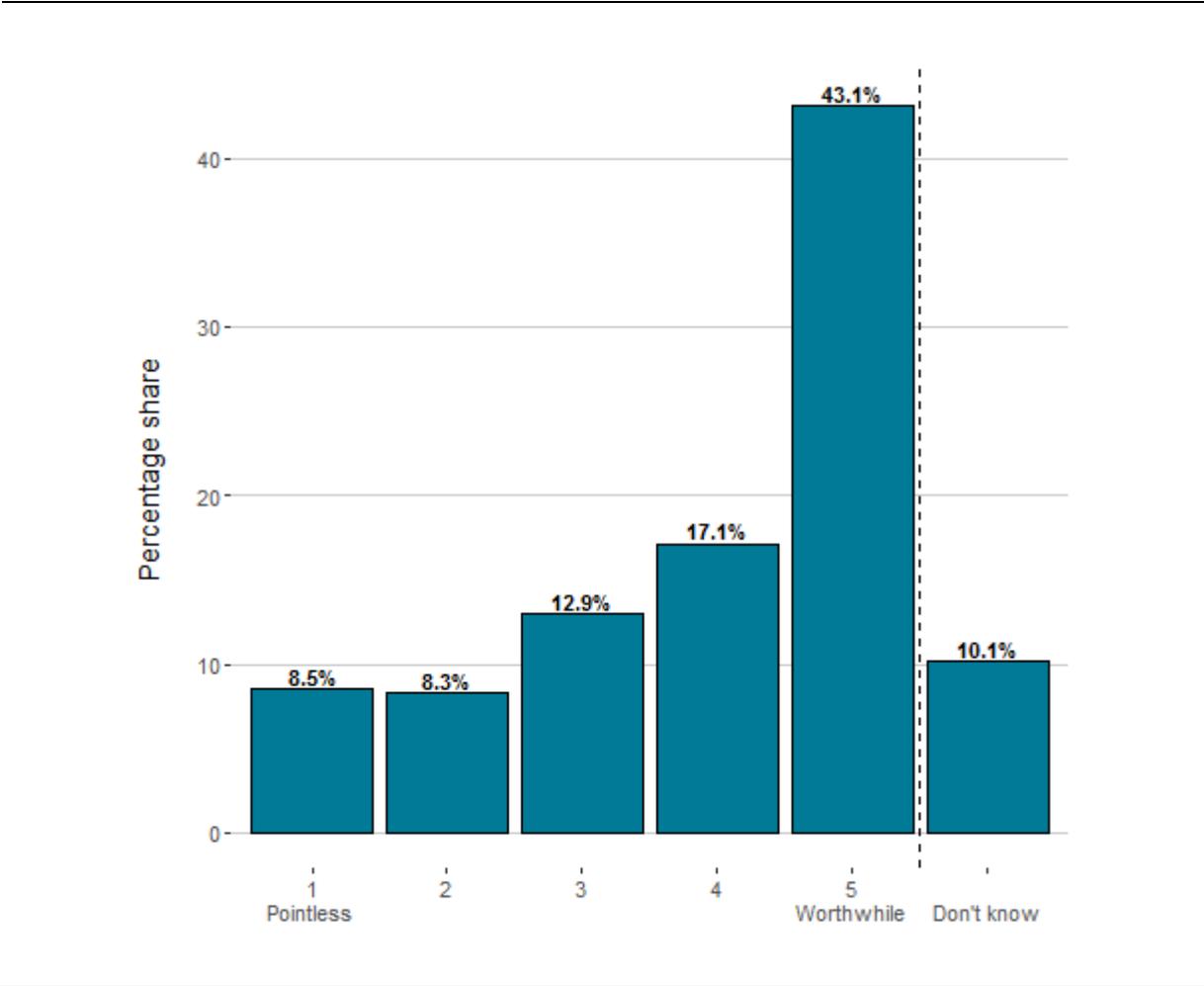
Figure 14: Agreement with test runs in Switzerland



Note: Responses to the question « Autonomous cars and buses are currently being tested at various locations in Switzerland. In general: How much do you support or reject such attempts?»

A similar pattern is observable for the question of the project Route 12. Around 60% of participants who were aware of the project have chosen the two highest categories on a scale of „pointless“ to „worthwhile“. Figure 15 summarises these results. It can also be seen that not even 20% of participants chose the two lowest categories. Public support for Route 12 seems to thus be clearly given.

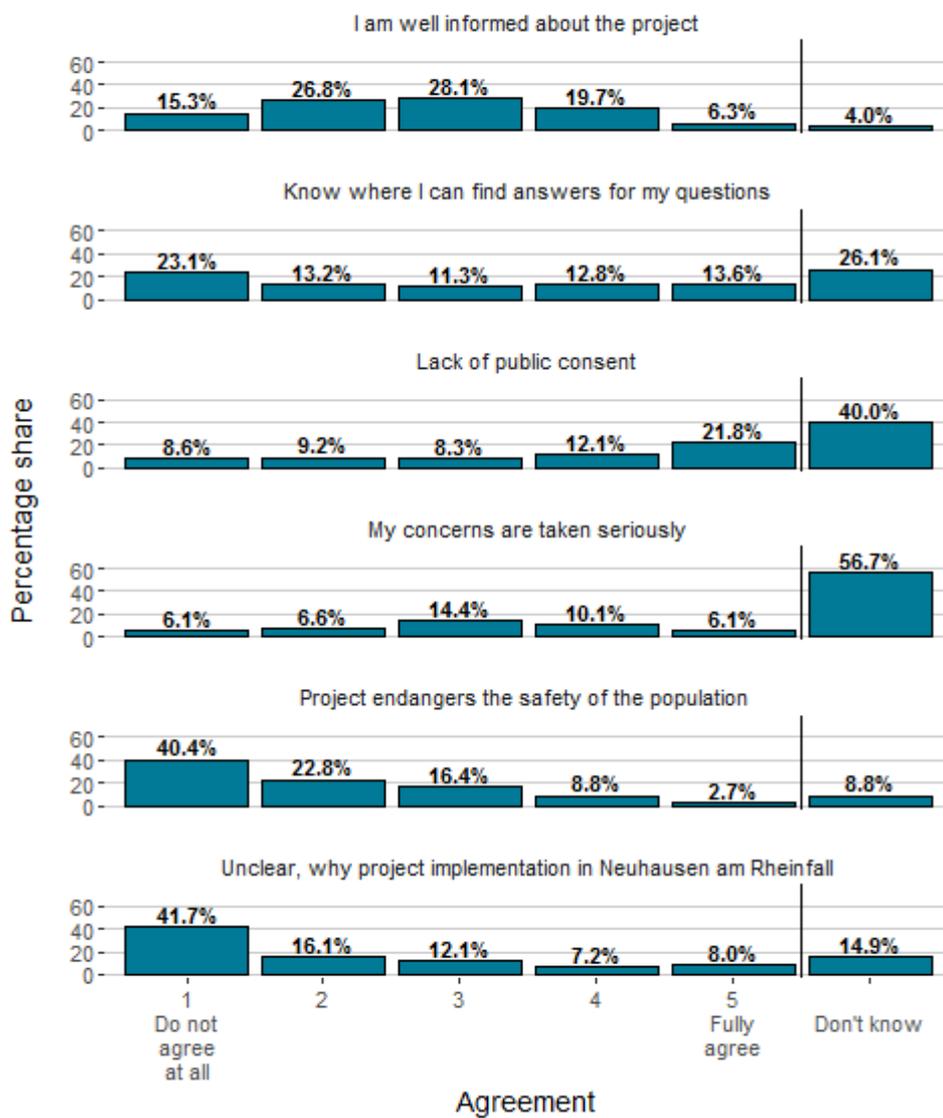
Figure 15: How do you assess the autonomous bus project in Neuhausen am Rheinflall in general? (N=858)



4.4 Public perception of Route 12

Figure 16 summarises several aspects regarding the public perception of the project Route 12. While there are barely any doubts that the project does not cause a risk and it is also not questioned why Route 12 is being tested in Neuhausen am Rheinflall, participants seem to only be superficially informed about the project. A majority of participants stated that they did not know whether the public’s consent was taken into account or whether the public’s concerns are taken seriously. This seems to suggest that there is no high demand for information. At the same time, however, the majority of participants knows who to contact regarding potential questions about the project. It seems, therefore, that improvements could be made regarding the availability of information and their communication through the responsible authorities.

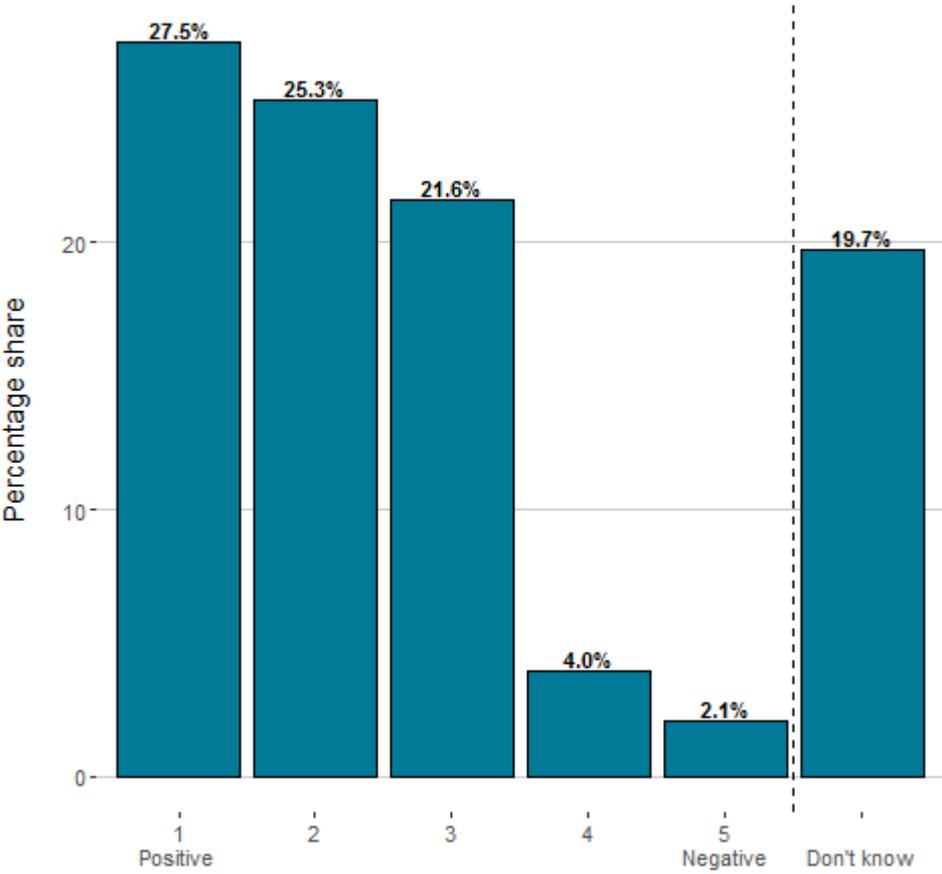
Figure 16: Public perception of Route 12 (N=859)



Note: Responses to the question «How much do you agree or disagree with the following statements regarding the autonomous bus project in Neuhausen am Rheinfall?»

Figure 17 shows the responses to the question which consequences Route 12 is expected to have on the Canton of Schaffhausen as a location for business. Generally, these consequences are judged as very positive. However, at almost 20% many participants refrained from answering this questions by choosing the option „Don't know“.

Figure 17: In your view: How does the autonomous bus project in Neuhausen am Rheinfall affect the Canton of Schaffhausen as a business location? (N=858)



5 Conclusion

While the participants seem to have some concerns and unanswered questions regarding the transition towards automated road traffic, test trials such as the one in Neuhausen am Rheinfall seem to enjoy high levels of support. Concerns regarding a general transition are mainly directed at the misuse of software and data. However, interaction with weaker members of traffic such as cyclists and pedestrians as well as the reaction in unexpected situations lead to some scepticism regarding autonomous driving.

There are some subtle differences connected to demographic factors, for example regarding the fear of a loss of jobs, which seems to be present especially in participants without tertiary education. However, women and people under the age of 40 also voiced significantly higher levels of concern regarding the potential loss of jobs caused by a transition towards autonomous vehicles. Women also state fewer concerns about the general transition. However, they judge potential issues such as the loss of control over driving as more concerning.

Participants show relatively high trust in the systems themselves. System safety and reliability rank best compared to other concerns. Participants were sceptical about a potential transmission of data from cars to the state. A large majority rejected the transmission of data to the Road Traffic Department. Even clearer was the rejection of data transmission to the Swiss Federal Tax Administration.

The population is highly aware of the existence of the test trial in Neuhausen am Rheinfall. Prior to the launch of the Route 12, around 70% of participants in the three municipalities knew about the planned execution of this test run – a large majority through the newspaper. The concerns regarding this trial were also generally low. This means that the test run in Neuhausen am Rheinfall receives support from the majority of the population. Around 60% of participants judged the project to be useful.

Nonetheless, improvements can be made regarding the availability of information for the population. Only a minority of those who know about the project consider themselves well-informed about it. They do not know who they might contact to ask questions about the project, or whether concerns voiced by the population are even taken into account.

To what extent these attitudes will change over time, and whether the test trial in Neuhausen am Rheinfall will have positive or negative consequences for the public's opinion on autonomous driving will be investigated through the two future surveys.

Appendix

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A1 Concerns question

To what extent do you agree or disagree with the following statements? The idea, that autonomous cars and buses are introduced comprehensively causes me concern because...

	Strongly disagree				Strongly agree
	(1)	(2)	(3)	(4)	(5)
...privacy is not sufficiently protected	<input type="radio"/>				
...software could potentially be hacked or misused otherwise	<input type="radio"/>				
...it is not clear who is responsible for accidents	<input type="radio"/>				
...the vehicle systems are not safe	<input type="radio"/>				
...the systems are not reliable	<input type="radio"/>				
...the enjoyment of driving will be lost	<input type="radio"/>				
...the driver loses all control	<input type="radio"/>				
...jobs will be lost	<input type="radio"/>				

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