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D4.5 – Report on VTT in Crowdsourced Micro-tasks

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Public report describing the results of the case study on VTT in crowdsourced micro-tasks. D.4.5 is associated to the MoTiV Task 4.5 described below. It is based on the input from two conducted surveys: MoTiV Ridesharing and PiggyBaggy.

Description of Task 4.5 “Case Study on Crowdsourced Micro-tasks”

Task 4.5 Case Study on Crowdsourced Micro-tasks (CoRe). A specific study of an application moving away from the “speed paradigm” of VTT and in which the participation in requesting/delivering of micro-tasks has an effect in routing/mode choice. The case study will be conducted in at least two EU countries, one being Finland.

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Table of Contents

About MoTiV	5
Partners	5
Abbreviations and Acronyms	5
MoTiV Consortium Partners and Acronyms	6
Executive summary	7
1. Introduction	8
1.1 Purpose and scope	8
1.2 Structure of the document	8
2. Crowdsourced micro-tasks	8
2.1 Types of tasks	8
2.2 Within MoTiV project scope	9
3. Implementation	10
3.1 Design iterations	10
3.1.1 Original plan	10
3.1.2 Separate survey	10
3.1.3 Final study design	12
3.2 Stakeholders	13
3.2.1 Stakeholder organizations	13
3.2.2 Municipal stakeholders	14
3.3 Woorti survey	15
3.3.1 Hypotheses	15
3.3.2 Questions	15
3.3.3 Grouping	17
3.3.4 Woorti trip data	18
3.4 PiggyBaggy data collection	19
3.4.1 Registration	19
3.4.2 Ride feedback	20
4. Results	20
4.1 Woorti survey	20
4.1.1 Group sizes	20
4.1.2 With whom to share	22
4.1.3 Motivation to share	24
4.1.4 Reasons not to share	26
4.1.5 Types of trips to share	28

4.1.6	Timing of trips to share	30
4.1.7	Attitudes towards car use	32
4.1.8	Acceptable extra trip length	34
4.2	Data collected from PiggyBaggy	36
4.2.1	Group sizes	36
4.2.2	Motivation to share	36
4.2.3	Acceptable extra trip length	36
4.2.4	Other questions	37
5.	Conclusions	38
5.1	Analysis of results	38
5.1.1	Groups	38
5.1.2	Countries	38
5.1.3	Hypotheses	39
5.1.4	Validation with PiggyBaggy	41
5.2	Recommendations	44
Annex 1:	Woorti and PiggyBaggy questions	46

About MoTiV

The Horizon 2020 project MoTiV (Mobility and Time Value) addresses the emerging perspectives on changing Value of Travel Time (VTT). Accordingly, it explores the dynamics of individual preferences, behaviours and lifestyles that influence travel and mobility choices. In other words, what does value of travel time mean for the end users, in relation to their travel experience?

The MoTiV project addresses VTT from the perspective of a single individual with a unique combination of personality, preferences, needs and expectations, in contrast with the traditional viewpoint of the economic dimension (time and cost savings). Its approach aims at achieving a broader and more interdisciplinary conceptualisation and understanding of VTT emphasising its “behavioural” component.

The main goal of the MoTiV project is to contribute to advancing research on VTT by introducing a conceptual framework for the estimation of VTT at an individual level, based on the value proposition of mobility. The conceptual framework will be validated through data collection and evaluation in at least 8 EU countries. The mobility and behavioural dataset will be collected using a mobile application developed by the project consortium, which will combine and integrate in an innovative way features from a multi-modal “journey planner” and an “activity/mobility diary”. With this mobile app, end-users will be able to more easily track, understand, and re-evaluate travel decisions to make the most of their free time in accordance with personal preferences, lifestyle, interests, and budget. The target is to engage in the data collection process a minimum of 4000 participants actively using the MoTiV app for at least two weeks. Besides validating the conceptual framework, the dataset will be made available to the scientific community as an Open Dataset to stimulate further research in this area.

The MoTiV project findings will produce scientific and policy outcomes, as well as potential business developments, including the development of new mobility services and the extension of existing applications, such as the ones offered by the business partners of the Consortium (i.e. *routeRANK journey planner*¹ and the *PiggyBaggy*² app for crowdsourced deliveries)

Partners



Abbreviations and

Acronyms

API Application Programming Interface

¹ <https://www.routerank.com>

² <http://piggybaggy.com>

AWS	Amazon Web Services
CSV	Comma Separated Values
DCC	Data Collection Campaign
MTK	Union of agricultural producers and forest owners
TTB	Travel Time Budget
VTT	Value of Travel Time

MoTiV Consortium Partners and Acronyms

Acronym	Full name
UNIZA	Žilinská univerzita v Žiline
CoRe	CoReorient Oy
ECF	European Cyclists' Federation ASBL
EUT	Fundació Eurecat
INESC ID	Instituto de Engenharia de Sistemas e Computadores, Investigação e Desenvolvimento em Lisboa
routeRANK	routeRANK Ltd
TIS	Consultores em Transportes Inovação e Sistemas S.A.

Executive summary

The MoTiV project has developed Woorti, an application to collect a European-wide dataset and build on data-driven approaches to revise the concept of value of travel time (VTT). As part of the project, a separate case study was made to study whether the participation of a user in requesting/delivering of micro-tasks would lead to moving away from the “speed paradigm” of VTT and have an effect in routing/mode choice.

The approach and design of the study evolved during the project as it was understood how important user experience, understandability and risk minimisation were for even a research oriented consumer service. The final design involved a survey made to Woorti users in four countries, and separate addition of comparable questions to the PiggyBaggy ride sharing and carpooling service in order to validate the Woorti survey results. The survey and question answers were complemented with trip data collected by Woorti and PiggyBaggy.

There were difficulties in launching the PiggyBaggy activation campaigns because stakeholders dropped out one by one, until cities and municipalities could be engaged effectively after the conclusion of the Woorti Data Collection Campaigns (DCCs).

The study addressed six of the research hypotheses of the MoTiV project. The Woorti survey respondents were divided into 11 user groups, but most of these had too few respondents to be statistically significant, especially country-specific groups but also groups that were most relevant for the purpose of offering or asking for shared rides.

The key conclusions were that it is possible to improve the efficiency and sustainability of the transport system by having more people share rides, especially to work or schools. A large number of people think that it would make travelling easier, but it must provide cost savings and address concerns over unwanted efforts. Communications can work through the employers and educational organisations to reach the potential users, and can use examples where the detours and pick-up and drop-off of the passenger can take a realistic amount of time. It must also be adjusted to local cultural preferences since they vary by region in Europe.

At the level of an individual, a car user can tolerate a detour of on average up to 5-10 minutes or 15-25% of the total trip duration. At the level of the transport system, every offered car ride could potentially cause a reduction of 28.5% of overall car trips. The potential reduction of an average car trip (across all 4 countries) is 17%, and the reduction varies from 3% to 18% depending on the trip type and country when taking into account the interest of people to share rides on those types of trips. The cost to achieve this impact is low to none because of non-monetary motivational factors and direct cost savings of the costs of using a car or an alternative transport mode. Investment is needed in the technical means to enable ride sharing across all the different trip types, and roll-out projects to create use experiences that can solve the barriers to adoption, and these are what CoReorient is trying to achieve together with the Finnish cities and municipalities.

1. Introduction

1.1 Purpose and scope

MoTiV is a research project that aims at addressing research questions related to the perceived value of travel time and the factors that influence it. This is primarily done through collecting mobility and value of travel time data from end users through a smartphone application called Woorti in Data Collection Campaigns in 8 countries. The app development was led by INESC ID – Instituto de Engenharia de Sistemas e Computadores, whilst the national campaigns were managed directly by the project partners and third-linked parties, under the coordination of the WP and project coordinator, University of Žilina, Slovakia.

This document was produced by CoReorient Oy, the leader of MoTiV project Task 4.5, “Case Study on Crowdsourced Micro-tasks” which is a specific study of an application moving away from the “speed paradigm” of VTT and in which the participation in requesting/delivering of micro-tasks has an effect in routing/mode choice. The case study was to be conducted in at least two EU countries, one being Finland.

1.2 Structure of the document

After this introduction, chapter 2 will introduce various types of crowdsourced micro-tasks and their relation to mobility, and the types selected in the project, allowing the reader to better understand the scope of the study. Chapter 3 will concentrate on the approach and implementation of the study. Chapter 4 will present the results the surveys performed with the Woorti application and the PiggyBaggy service. Chapter 5 will conclude with analysis and recommendations. Annex 1 lists the survey questions and answer options used in the Woorti application and the PiggyBaggy service.

2. Crowdsourced micro-tasks

2.1 Types of tasks

Crowdsourced micro-tasks in the context of the MoTiV research project mean tasks that travelling individuals perform for other requesting individuals as part of the overall travel and that increase the travel time. Tasks that the travelling individuals perform for themselves or that they perform due the travel purpose during or at the origin or destination of the travel are not considered crowdsourced micro-tasks in this context.

Therefore, for example, the following types of tasks are within the scope of this study: giving a ride to another individual during the whole trip or part of a trip that the travelling individual makes in any case (e.g. to get to work or back home); transporting the goods of another individual during the whole trip or part of a trip that the travelling individual makes in any case (e.g. during that individual’s own shopping trip); or escorting an elderly citizen safely to a healthcare center during the whole trip or part of a trip that the travelling individual makes in any case (e.g. to visit a service facility next to the healthcare center).

Conversely, for example, the following types of tasks are outside the scope of this study: giving a ride to another individual as a paid service by an Uber driver, transporting parcels or food orders for another individual as a paid service by a courier, or escorting an individual to a healthcare center by a volunteer just for the sake of the escorting

trip itself. Furthermore, the following types of tasks are outside the scope of this study: the travelling individual writes a work email or makes online shopping while travelling in a train; the travelling individual travels to a destination to repair his house or vehicle there; or the travelling individual travels to a destination to perform a gig work task or volunteer task for another individual there.

Ride sharing, carpooling, or helping someone by transporting their goods or escorting them are typically tasks that people do for family, relatives, friends or co-workers. In the context of this study, the focus is on tasks that people do for other individuals. Crowdsourcing is a method where individuals can request anyone to help them with such tasks, by using an online service or application rather than calling or otherwise contacting potential travellers one by one. This mediation can be performed with a Facebook page, other types of social media, some dedicated online notice board or auction service, or a browser based or mobile application specifically designed for ride sharing, carpooling, social deliveries or volunteering. In the case of tasks crowdsourced through social media or dedicated applications the data associating the crowdsourced tasks to the users and trips is not accessible to external parties.

2.2 Within MoTiV project scope

CoReorient Oy in Finland has since 2014 operated its own browser based crowdsourced transport service, called PiggyBaggy.com. The service was originally developed for social deliveries where individuals can transport the goods of other individuals on their way, and was later extended to support also ride sharing or carpooling. The service has been in use in various trials and pilots in multiple cities in Finland (e.g. Jyväskylä, Lahti and Helsinki) before the MoTiV project.

With the rise of ride hailing services (e.g. Uber), courier services (e.g. Foodora) and ride sharing services (e.g. BlaBlaCar), crowdsourcing is already commonplace in transport. The potential of crowdsourcing to utilize the transport capacity or passenger cars that drive with often just the driver is a very interesting way to increase the sustainability and efficiency of the transport system. Therefore, the access to the PiggyBaggy service within the consortium was an opportunity to include crowdsourcing into the study of value of travel time (VTT), because it allows the collection of data of both the crowdsourced tasks and the associated trips.

While the PiggyBaggy service allows users to use it for both ride sharing or carpooling as well as social delivery or even escorting other people during the trip, the scope for the study has to also take into account the tasks that most accessible users would use it for, as well as the tasks that most reference users would easily understand to allow comparisons. Considering both PiggyBaggy users and reference users, the focus of the study was selected to be on ride sharing and carpooling rather than social delivery or escorting. This is reflected in the survey questions.

3. Implementation

3.1 Design iterations

3.1.1 Original plan

The original plan at the time of MoTiV project preparation for the implementation of data collection on crowdsourced micro-tasks and comparison to other collected travel data was to integrate the social delivery functionality of the PiggyBaggy service into the application to be developed in the MoTiV project, later called Woorti. This was technically feasible, but involved some challenges:

- The number of users who would have voluntarily used both of the key functionalities (MoTiV users finding another MoTiV user to transact with, or PiggyBaggy user also participating in a data collection campaign) was expected to remain insufficient for good results.
- Significant additional efforts would have been required for user support in the countries outside Finland.
- The related IPR issues would have to be addressed.

As the Woorti application design progressed, it became clear that adding social delivery functionality to Woorti would also make it more difficult to achieve a good Woorti user experience as well as increase technical risks for the overall project.

3.1.2 Separate survey

The original plan was modified to allow the collection of similar data from two sets of users: Woorti and PiggyBaggy users. This was done by decoupling the social delivery implementation and service from Woorti, while still having a dedicated implementation of data collection and database on crowdsourced micro-tasks for the MoTiV project. Data collected with the survey functionality in Woorti from users who could give their opinions about crowdsourced micro-tasks could in this approach be validated with data collected from users who actually participated in crowdsourced micro-tasks.

The implementation in this revised approach was optimised according to the project objectives and resources. It was decided to implement the PiggyBaggy data collection functionality as a completely separate web application, operated by CoReorient, that replicated as close as possible the surveys that would be presented to the Woorti users. In this way, the full attention and resources of INESC-ID could be dedicated to the already quite challenging development and operation of Woorti; the user experience for PiggyBaggy users could be managed with more seamless integration of the survey to the user flow of the service; and data protection could be managed more easily due to the Terms of Service and privacy policy of the PiggyBaggy service already supporting data collection for research purposes. The separate web application and an API to the PiggyBaggy service were implemented. Anonymised trip data from users performing rides with PiggyBaggy would be transferred over the API to the separate web application that would collect qualitative additional data comparable to the Woorti survey questions from the user.

The implementation progressed in two phases, with the first one being a service that could be launched from PiggyBaggy or an external service for the purpose of users entering VTT specific survey data that would be combined

with the trip and trip leg data provided by the launching service. The second phase was the final implementation and iterated the first phase implementation to consist of the following components:

1. PiggyBaggy modifications to collect data by launching in specific parts of the PiggyBaggy service similar surveys as the Woorti surveys (from user profile, when making a ride/delivery offer or request, and when reporting ride/delivery completion), and to extract and anonymize trip parameters from the associated PiggyBaggy trip to provide as part of the survey responses.
2. Web application to remind the user of the measures to protect their submitted data and collect responses to one of the three surveys (user profile, pre-trip and post-trip data), and the anonymised trip parameter data.
3. Database (separate from PiggyBaggy database) to store the collected and anonymised survey response and trip data for further analysis by CoReorient in T4.5, and by WP5. The database received the data with a simple API.

The Web application was implemented using Angular on the frontend and Laravel (PHP) Framework on the backend. The database was implemented using MySQL. The web application and database were run in a single instance on AWS. The database contents could be exported into a CSV file for analysis.

Because the case study implementation collected only data that could not be associated to individuals, and was implemented as a stand-alone instance without any interfaces to other services outside the control of CoReorient, there were no complications to comply with data protection requirements. The API calls were authenticated with a static security token.

Trip data provided by PiggyBaggy included the following variables: distance (0.1 km accuracy), duration (0.25 h accuracy), weekday, time of day (morning 6-9, 9-12, 12-18, evening 18-24, night 24-06). The PiggyBaggy API call also included the preferred language of the surveys (Finnish or English), the survey to be launched, and a hash of the PiggyBaggy user ID (to associate multiple trips to the same individual, with the hash to be replaced by a random number after the case study data collection to prevent reverse resolution of the user ID). Micro-task specific variables (e.g. detour distance and duration, compensation) were not collected because they were not available for comparison purposes from the MoTiV application trip data or surveys.

The surveys consisted of 11 multiple-choice questions:

- 2 initial questions on readiness to request or offer micro-tasks and reasons for that
- 1 initial question (only in PiggyBaggy) to identify user's area as urban, suburban or rural
- 5 pre-trip questions on the vehicle used (only in PiggyBaggy), readiness to request or offer micro-tasks for the specific planned trip and reasons for that, and the parts of trips that would be more or less worthwhile due to the micro-task
- 4 post-trip questions on the vehicle used (only in PiggyBaggy), reasons for requesting or offering micro-tasks for the specific planned trip, and the parts of trips that would be more or less worthwhile due to the micro-task

The implementation was tested after integration with the PiggyBaggy service, and could be easily modified to accommodate potential developments in the MoTiV conceptual and analytical framework that could lead to different trip parameters or survey questions and answers used in the Woorti surveys, which would then require similar adjustments to the surveys launched from the PiggyBaggy service.

Example screenshots of the surveys:

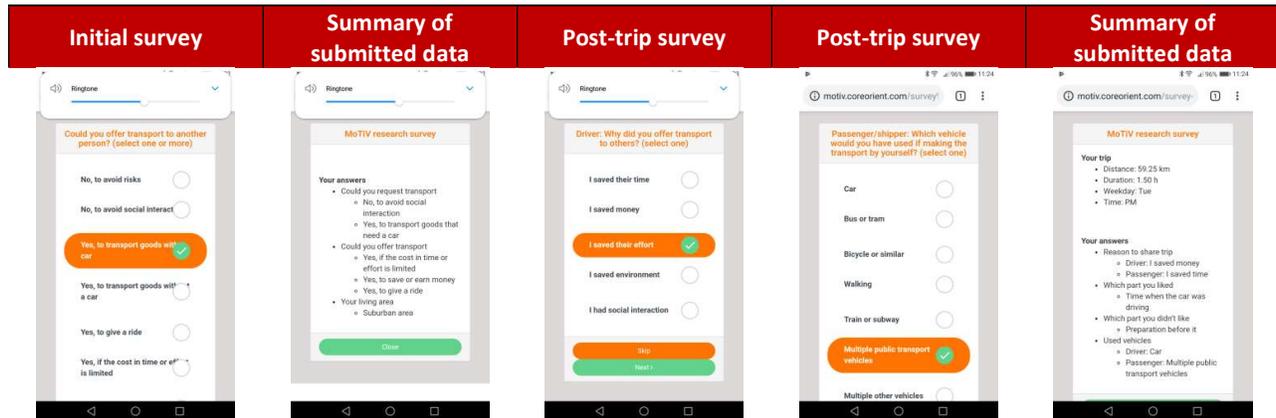


Table 1 – Screenshots of the separate web application for collecting data from PiggyBaggy users

3.1.3 Final study design

While the separate survey design addressed the technical and user experience risks to Woorti development, it still faced challenges that required rethinking:

- Starting operations of the PiggyBaggy service outside Finland just for the MoTiV research project would still be required, and at this point it was already clear that the Woorti data collection campaigns (DCCs) would require significant resources as well.
- The surveys were still very demanding for the Woorti user without much familiarity with social delivery or ride sharing related concepts, as well as the PiggyBaggy user without pre-existing interest to participate in research (in contrast to getting cost savings or utility value from the service).
- The activation of old PiggyBaggy users to perform more crowdsourced micro-tasks and participate in the research had not turned out to be successful, and it was necessary to recruit new users (with a focus on ride sharing and carpooling), raising the importance of initial data collection during registration in the PiggyBaggy service.

Taking into account all these challenges, the solution was to keep the PiggyBaggy service in operation only in Finland but target the Woorti surveys to the DCC users in four countries. In this way, the data collected from PiggyBaggy users (actual ride sharing users) could be used to validate the opinions of people who answered to the survey questions in the Woorti application (hypothetical ride sharing users).

The Woorti survey had to be also made easier and shorter, reducing the number of question and options and simplifying the language. This was done to prevent users quitting the survey before completion (due to excessive length or difficulties understanding what the questions or options meant). The resulting survey was then translated to all the languages in use in the four countries.

The PiggyBaggy survey implementation was revised by implementing the questions as part of the service itself instead of forcing the user to go to a separate web application that they were unfamiliar with and could see as a security threat, leading to them quitting the survey and possibly the PiggyBaggy service as well. Additional optional questions were very carefully added to the registration process. This was done to ensure ability to validate the most critical Woorti survey questions even if the newly registered users would not manage to perform shared rides or

answer the other survey questions during the project period. Other very limited questions were added to the feedback process for shared rides that had been completed. All questions were available in Finnish and English, depending on the service language.

The image displays two side-by-side screenshots of the PiggyBaggy user interface. The left screenshot, titled "Registration", shows a form for providing personal and work information. It includes fields for Phone Number (with a sample number 555 5555 5555), Work Email, Introduction, Work Address, Select Group, and Select work schedule (with a sample "Mon-Fri 8-16"). There are also checkboxes for "Acceptable detour (min)", "Hide my exact home location", and "Your expectations from ride sharing?". A dropdown menu for "Your expectations from ride sharing?" is open, showing options like "Easier travel", "Cost savings or benefits", "Helping or meeting people", "Helping the environment", "Good reputation", and "Other". The right screenshot, titled "Feedback", shows a form for providing feedback on a ride. It includes a dropdown for "Why did you offer or request this ride?", a text input for "How many minutes more did your trip last due to this shared ride?" (with a sample value of 10), and a question "Would you recommend a shared ride like this to others?" with "Yes" and "No" radio buttons. Both screenshots have a red header bar with their respective titles.

Table 2 – Screenshots of the questions for collecting data from PiggyBaggy users in registration and feedback

The Woorti survey is presented in section 3.3 and the data collection from the PiggyBaggy service is presented in section 3.4. The detailed Woorti survey questions and answer options, and questions and answer options added to the PiggyBaggy service processes, are presented in Annex 1 and Annex 2, respectively.

The Woorti surveys were launched in the end of September 2019 (Finland and Portugal), beginning of October (Slovakia) and mid-October (Spain, due to the initially launched survey missing one of the questions). The PiggyBaggy data was collected mostly between September 2019 and February 2020 (Finland).

3.2 Stakeholders

3.2.1 Stakeholder organisations

There were over 2500 users in the PiggyBaggy service when the MoTiV project started, but the user activity was mostly dependent on activation of the users in particular regions in collaboration with local stakeholders such as cities, companies or associations. The activation of these old PiggyBaggy users to perform more crowdsourced micro-tasks and participate in the research was also attempted, but did not turn out to be successful. It was therefore necessary to develop similar collaborations with stakeholders to support data collection for the MoTiV project. It was also considered optimal if the same stakeholders would participate in the MoTiV DCCs, because then it would be possible to collect data from users who would be both Woorti and PiggyBaggy users, allowing more detailed analysis.

Sufficiently large scale collaborations could not be established with key stakeholders despite lengthy negotiations:

- A proposal was made to a ferry company on ride sharing between ferry passengers to/from the main harbour between Finland and Estonia with millions of passengers annually (with the additional benefit of getting data from a second country, even if outside the MoTiV project countries). The ferry company closed the advanced negotiations when the endorsing organisation representing the public sector withdrew from the planned project (as it was no longer possible to have a PPP project).
- A proposal was made to the Helsinki regional transport authority on ride sharing integration to the public transport system. However, the organization focused its available resources to trials of an on-demand shared taxi service and a docking station-based e-scooter service.
- A proposal was made with the Union of agricultural producers and forest owners (MTK) to provide ride sharing services for rural regions and smaller cities. Unfortunately, the process in the Association of Finnish municipalities was extremely slow (taking 1,5 years, until the end of the MoTiV project) before anything concrete could be started in a coordinated manner.
- Other discussions with large companies in retail, logistics, transport or real estate sectors also did not lead to concrete collaborations.

3.2.2 Municipal stakeholders

Cities and municipalities had already been involved in earlier PiggyBaggy activation campaigns due to their interest in sustainability and to a lesser degree community building. Therefore, they were also in the target group of stakeholders for recruiting and activating PiggyBaggy users. However, there were also some challenges on establishing the collaborations:

- Cities and municipalities could not run multiple parallel sustainable transport related activities involving communications. PiggyBaggy would have cannibalized stakeholders from Woorti DCCs. Therefore, they could be approached only after the Woorti DCCs had ended. Due to the delays in Woorti DCCs, this was possible only in December 2019, and the stakeholder decisions on activation campaigns were postponed over the year-end holidays to January 2020.
- Cities and municipalities hesitated starting an activation campaign for a service that other municipalities had not already used, and the focus of the PiggyBaggy service was during the MoTiV project changed from social delivery to more broadly appealing ride sharing and carpooling (especially for commuting).
- The expectations of cities and municipalities that had participated in Woorti DCCs were in many cases not met, and the user experience issues or difficulties in activating users for the Woorti application were projected to the possible PiggyBaggy activation campaigns. This required more efforts to convince these stakeholders.

The involvement of municipal stakeholders was phased so that an activation campaign with the refocused PiggyBaggy service was first made in September-December 2019 with Vantaa, a large city that did not participate in the Woorti DCCs. This reduced the risk for other municipalities, and some of them were approached as a continuation of the Woorti DCCs (it is also notable that the two large cities of Tampere and Turku that decided not to participate in Woorti DCCs became involved in the PiggyBaggy phase). Other municipalities were approached separately with the support of MTK around the process of the Association of Finnish municipalities.

Whereas 25 municipalities participated in the Woorti DCCs, by mid-February 10 cities and municipalities (including 3 large cities) were ramping up PiggyBaggy activation campaigns with 25 more having expressed interest but not yet started.

However, due to the COVID-19 epidemic, by early March, one by one the already active municipalities put the planned marketing campaigns on hold indefinitely, and others practically stopped the negotiations for a campaign. During March it was proposed (to the relevant Ministries, to the Association of Finnish Municipalities, and to selected municipalities with campaigns on hold) that the service itself could be adapted to organise food distribution by volunteers to people quarantined at home. Despite their interest, this change could not yet be implemented by the end of March, and did not help in the recruitment of a larger sample for this study.

3.3 Woorti survey

3.3.1 Hypotheses

The survey was designed to address the following MoTiV hypotheses. Many of them are dependent on the determination of the value of the travel time of a shared ride, which is investigated with question 3.

#1: Door-to-door time	In question 3, an option was included to determine how faster travel (“easier travel”) affects the interest to select the travel choice of sharing the ride.
#2: Reliable door-to-door time	In question 4, an option was included to determine how the reliability (“lack of trust in others”) affects the interest to select the travel choice of sharing the ride.
#3: Trip planning time	In question 4, an option was included to determine how the trip planning effort affects the interest to select the travel choice of sharing the ride.
#4: Time constraints	In question 5, it is possible to determine to some degree the differences between trips with typically harder time constraints (e.g. commuting to work) or more relaxed time constraints (e.g. leisure).
#6: Travel time budgets	In question 7, it is possible to determine how much the daily Travel Time Budget (TTB) could be increased in absolute terms.
#11: Unwanted efforts	In question 4, it is possible to determine how the cognitive or emotional effort affects the interest to select the travel choice of sharing the ride.

Table 3 – Research hypotheses investigated with the Woorti survey

3.3.2 Questions

The questions were designed to be simple, easy and quick to answer. For this reason, special terminology was avoided in the used language. Also the questions were focused only on ride sharing, since the less commonly known possible tasks such as social delivery and escorting would involve the risk that the user does not answer the survey due to frustration on too many questions and difficult to understand options. In addition to English, the survey questions were translated into Finnish, Slovak, Spanish, Catalan and Portuguese and were presented to Woorti users in the language that they had selected to use in their application.

In most questions, the respondents could separately select options indicating that they are not interested in ride sharing. In a survey where the participation in ride sharing was very hypothetical for the respondents, it was important to be able to determine with better granularity the level of interest for the individual with multiple questions.

1. Could you share rides with other people?	Multiple choice (select only one answer option) This question allows us to determine whether ride sharing could affect the value of travel time more broadly, or is considered only as an activity to do with family, friends and acquaintances.
2. How could you share rides with others?	Multiple choice (select any number of answer options) This question allows us to group the answers according to whether the respondent could offer or ask for a ride, or is not interested in ride sharing (in which case their answers to other questions are also irrelevant).
3. What would motivate you to share rides?	Multiple choice (select any number of answer options) This question allows us to determine especially the importance of financial benefits in comparison to other types of value that people expect to receive in order to tolerate the additional travel time that they would have if offering shared rides.
4. What could prevent you from offering rides?	Multiple choice (select any number of answer options) This question allows us to determine whether ride sharing could affect the value of travel time more broadly, and especially whether the respondent perceives a risk of increase in the overall travel time due to arranging the shared ride.
5. For what trips would you share rides?	Multiple choice (select any number of answer options) This question allows us determine whether ride sharing could affect the value of travel time more broadly across different types of trip destinations.
6. When would you mostly share rides?	Multiple choice (select any number of answer options) This question allows us determine whether ride sharing could affect the value of travel time more broadly across different times when trips are made.
7. How much longer (min) could your trip be if offering rides?	Multiple choice (select any number of answer options) This question allows us determine how much extra time the respondent could tolerate in order to offer a ride, and whether the user is considering this primarily as absolute time or as time relative to the overall duration of the trip.
8. How much longer (%) could your trip be if offering rides?	Multiple choice (select any number of answer options) This question allows us determine how much extra time the respondent could tolerate in order to offer a ride, and whether the user is considering this primarily as absolute time or as time relative to the overall duration of the trip.
9. What role does car have in your everyday life?	Multiple choice (select only one alternative) This question allows us to group the answers according to whether the respondent actually uses a car and could offer a ride, or does not.

Table 4 – Questions in Woorti survey

Survey respondents could select multiple options in questions 7 and 8.

- By selecting one or two values for extra trip length in minutes and multiple values for extra trip length in percentage, they could indicate that only the absolute value of extra travel time matters, regardless of the overall trip length.
- By selecting one or two values for extra trip length in percentage and multiple values for extra trip length in minutes, they could indicate that only the relative change of the overall travel time matters, regardless of the absolute extra trip length.
- By selecting one or two values for extra trip length in minutes and one or two values for extra trip length in percentage, they could indicate that extra travel time must be constrained both in absolute as well as relative terms.
- By selecting multiple values for extra trip length in minutes and multiple values for extra trip length in percentage, they could indicate that the acceptability of the extra travel time can vary a lot depending on the context, circumstances and other factors.

3.3.3 Grouping

In addition to grouping by country (Finland, Slovakia, Spain and Portugal), the survey responses were further divided into different groups based on key survey answers.

A. All survey respondents	All survey respondents in each country and for all of the four countries. This includes respondents who have answered ambiguously in question 2 and are not counted in groups B, C, D or E.
B. All who could offer a ride	All survey respondents who had selected in question 2 the option “I could offer a ride”, even if they also selected the option “Not interested” in other questions than question 2 (those who answer both “I could offer a ride” AND “Not interested” in question 2 are not counted as their opinion is ambiguous). This group overlaps with group C for those users who were also in group D.
C. All who could ask for a ride	All survey respondents who had selected in question 2 the option “I could ask for a ride”, even if they also selected the option “Not interested” in other questions than question 2 (those who answer both “I could ask for a ride” AND “Not interested” in question 2 are not counted as their opinion is ambiguous). This group overlaps with group B for those users who were also in group D.
D. All who could offer and ask for a ride	All survey respondents who had selected in question 2 both of the options “I could offer a ride” and “I could ask for a ride”, regardless of any options they selected in other questions.
E. All who are not interested at all	All survey respondents who had selected in question 2 only the option “Not interested”, regardless of any options they selected in other questions.
F. All car users who could offer a ride	All those in group B who selected in question 9 regarding car use one of the options “I cannot live

	without it”, “I need it for many trips” or “I use it only because alternatives are not good”. This allows us to study the answers from those who are in a position to actually offer rides, instead of just thinking about it hypothetically.
G. All car users who could ask for a ride	All those in group C who selected in question 9 regarding car use one of the options “I cannot live without it”, “I need it for many trips” or “I use it only because alternatives are not good”. This allows us to study the answers from those who are in a position to either drive themselves or share a ride and thus increase the sustainability and efficiency of the transport system.
H. All car users who could offer a ride to stranger	All those in group F who selected in question 1 regarding sharing of rides the option “Yes, even with strangers”. This allows us to study the answers from those who could increase the sustainability and efficiency of the transport system more broadly, instead of just with a small group of other people.
I. All car users who could ask for a ride from stranger	All those in group G who selected in question 1 regarding sharing of rides the option “Yes, even with strangers”. This allows us to study the answers from those who could increase the sustainability and efficiency of the transport system more broadly, instead of just with a small group of other people.
J. All car non-users who could ask for a ride	All those in group C who selected in question 9 regarding car use one of the options “I don’t use it but ok if others use it” or “I don’t use it and others should not either”.
K. All car non-users who could ask for a ride from stranger	All those in group J who selected in question 1 regarding sharing of rides the option “Yes, even with strangers”. This allows us to study the answers from those who could increase the sustainability and efficiency of the transport system more broadly, instead of just with a small group of other people.

Table 5 – Groups for which survey question answers were analysed separately

3.3.4 Woorti trip data

In addition to the survey data, the user IDs in the surveys made it possible to retrieve key trip data that could be combined with the survey data. Because Woorti users did not necessarily report all types of trips or all trips during a day, we only focus on very basic parameters.

Average car (driver) trip duration	This allows calculation of the percentage of the extra travel time out of the average travel time in the case that the user was a driver.
Average car (passenger) trip duration	This complements the above, since in many cases the users could have also been the drivers for the trips in

	which they were passengers (or could influence whether shared rides are offered for those trips).
Average car (driver) trip distance	This allows comparison of the Woorti survey answers with the trip lengths of the PiggyBaggy users.
Average car (passenger) trip distance	This complements the above.

Table 6 – Woorti data to complement the survey data in the analysis phase

3.4 PiggyBaggy data collection

3.4.1 Registration

Users who registered in the PiggyBaggy service had already decided that they want to offer or ask for a ride with strangers. Furthermore, because they were not consciously participating in a research project but were primarily interested in actually performing shared rides, the questions had to be optional and relevant for the potential users. They also had to be very fast and easy to answer in order to avoid potential users deciding not to register at all. The following optional questions were therefore added to the service registration process (in addition to these, the home and work address entries allowed us to determine the distance of the commuting to work type of trips).

1. Offer/request rides	Multiple choice (select one or both tick box answer options) This question allows us to compare to Woorti survey groups H or combination of I and K (users may but are not expected to go and enter details in the user profile regarding whether they have a car).
2. Additional route for a ride Acceptable detour (min)	Number entry This question allows us to compare to Woorti survey question 7, and taking into account the distance of the work trip, also to question 8.
3. Select work schedule	Multiple choice (select one of three answer options) This question allows us to compare to Woorti survey question 6 for commuting to work type of trips (simplified options were Mon-Fri 8-16, Mon-Fri 9-17, Other). Users may but are not expected to go and enter details in the user profile regarding any work schedule different than in the presented options).
4. Your expectations from ride sharing	Multiple choice (select any number of answer options) This question allows us to compare to Woorti survey question 3 (options were almost word-for-word the same: Easier travel, Cost savings or benefits, Helping or meeting people, Helping the environment, Good reputation, Other)
5. Suitable ride compensation	Multiple choice (select any number of answer options) This question allows us to strengthen the comparison to Woorti survey question 3 regarding the importance of financial benefits (options were: Half of gas costs, All gas costs for the ride, Half of km allowance, All km allowance for the ride, Take turns in driver role, Ride should be free volunteering). The “km allowance” refers to the tax authority’s calculated overall cost of car use to compensate employees who use their private cars for business trips.

Table 7 – Optional questions in PiggyBaggy registration

Based on the registration data, the trip distances and durations could also be calculated even without the users making individual ride offers or requests. Because of the service design, users were at the time of registration indicating the trip for which they were ready to offer rides, or interested in requesting rides (if they could find a matching counterparty on the map).

- The distances of the trips were calculated as the distance between the user’s home and work addresses using the Google navigation service.
- The durations of the trips were calculated as the duration from the user’s home to work address at Monday morning if starting by car at 8:00 using the Google navigation service (ignoring the possible work schedules and their variations on different weekdays).

3.4.2 Ride feedback

Users who had registered in the PiggyBaggy service and participated in a completed ride (as driver or passenger) could answer two simple questions as part of the ride feedback process (the same requirement for easy and quick entry applied as in the case of registration). The feedback also asked whether the user would recommend the ride to others, and asked additional reasons if the answer was “no”.

1. Why did you offer or request this ride?	Multiple choice (select any number of answer options) This allows us to compare the motivations for actual shared rides with those in registration question 4.
2. How many minutes more did your trip last due to this shared ride?	Number entry (for drivers) This allows us to compare the extra travel time for actual shared rides with that in registration question 2.
3. How many minutes did you save in travel time due to this shared ride?	Number entry (for passengers) This allows us to compare the driver and passenger motivations against the difference in the travel time.
4. (if not recommending) Why not?	Multiple choice (select any number of answer options) This allows us to compare the reasons for bad experience in an actual shared ride with the concerns expressed by Woorti users in survey question on what could prevent them from offering a shared ride.

Table 8 – Optional questions in PiggyBaggy feedback

4. Results

4.1 Woorti survey

4.1.1 Group sizes

The absolute and relative sizes of the groups are presented in the following two tables.

	A: All	B: Could offer	B1: Could offer only	C: Could ask	C1: Could ask only	D: Could offer AND ask	E: Not interested at all	None: Could offer AND not interested	None: Could ask AND not interested	F: Car user, could offer	G: Car user, could ask	H: Car user, could offer to stranger	I: Car user, could ask from stranger	J: Car non-user, could ask	K: Car non-user, could ask from stranger
Finland	249	123	46	161	84	77	41	16	1	111	87	33	28	74	46
Slovakia	300	136	79	105	48	57	114	25	1	112	66	44	17	38	18
Spain	85	37	24	34	21	13	26	3	1	29	14	10	5	20	12
Portugal	134	54	34	47	27	20	51	4	0	44	28	4	7	18	6
All	768	350	183	347	180	167	232	48	3	296	195	91	57	150	82

Table 9 – Group sizes in absolute number of respondents

	A: All	B: Could offer	B1: Could offer only	C: Could ask	C1: Could ask only	D: Could offer AND ask	E: Not interested at all	None: Could offer AND not interested	None: Could ask AND not interested	F: Car user, could offer	G: Car user, could ask	H: Car user, could offer to stranger	I: Car user, could ask from stranger	J: Car non-user, could ask	K: Car non-user, could ask from stranger
Finland	100%	49%	18%	65%	34%	31%	16%	6%	0%	45%	35%	13%	11%	30%	18%
Slovakia	100%	45%	26%	35%	16%	19%	38%	8%	0%	37%	22%	15%	6%	13%	6%
Spain	100%	44%	28%	40%	25%	15%	31%	4%	1%	34%	16%	12%	6%	24%	14%
Portugal	100%	40%	25%	35%	20%	15%	38%	3%	0%	33%	21%	3%	5%	13%	4%
All	100%	46%	24%	45%	23%	22%	30%	6%	0%	39%	25%	12%	7%	20%	11%

Table 10 – Group sizes relative to all survey respondents

4.1.2 With whom to share

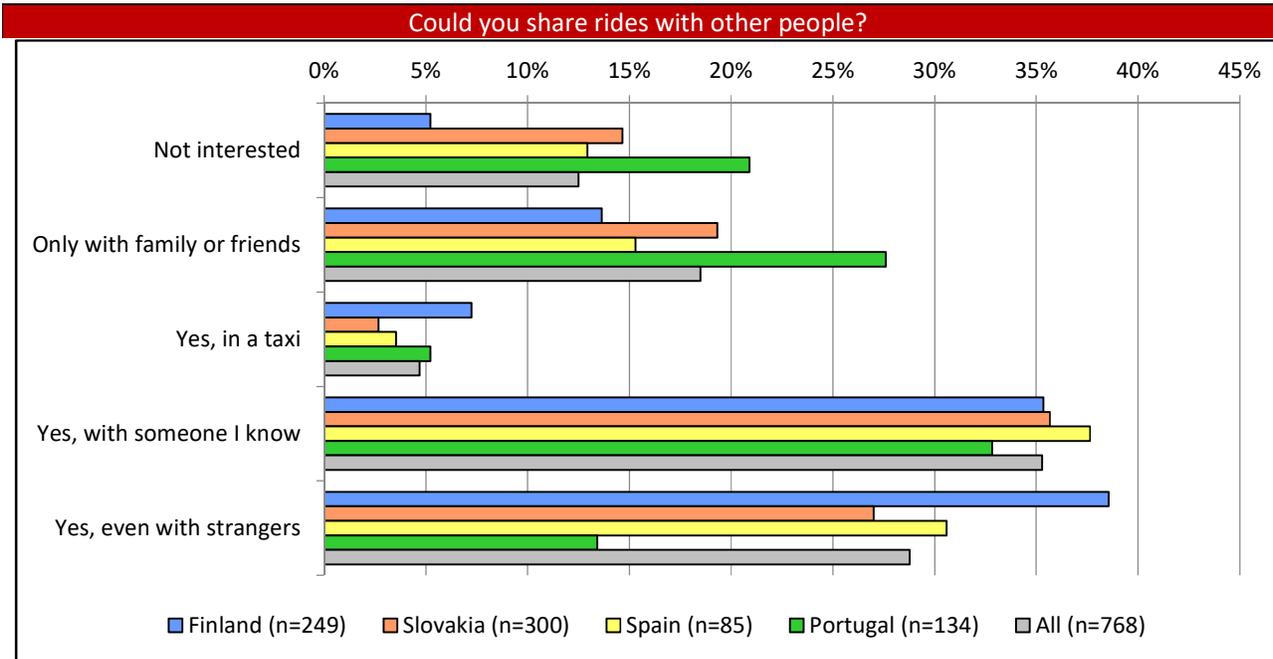


Figure 1 – All survey respondents

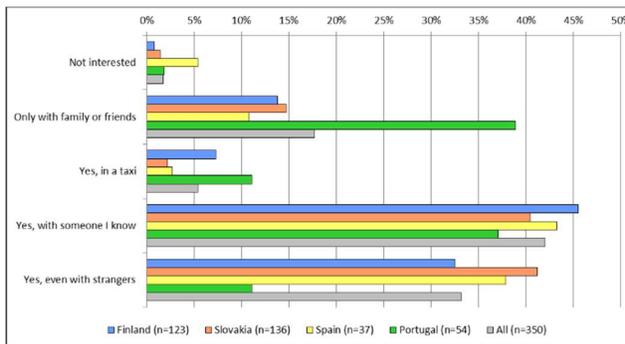


Figure 2 – All who could offer a ride

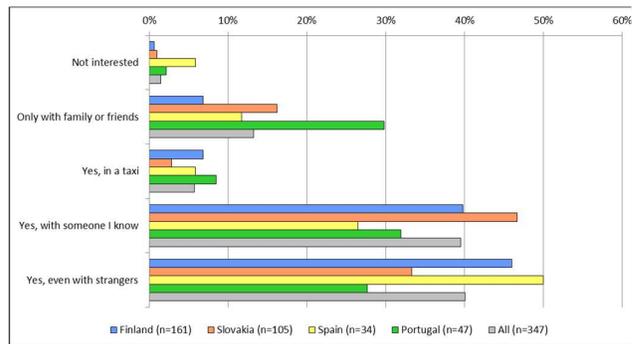


Figure 3 – All who could ask for a ride

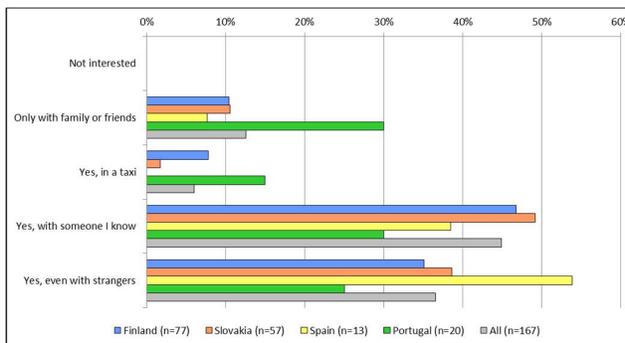


Figure 4 – All who could offer and ask for a ride

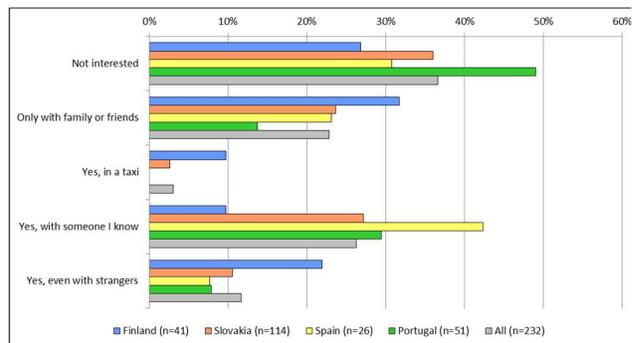


Figure 5 – All who are not interested at all

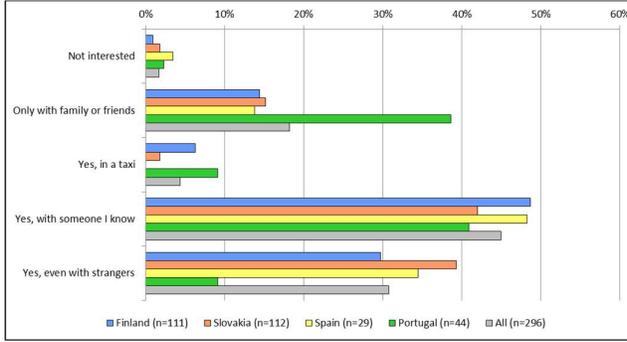


Figure 6 – All car users who could offer a ride

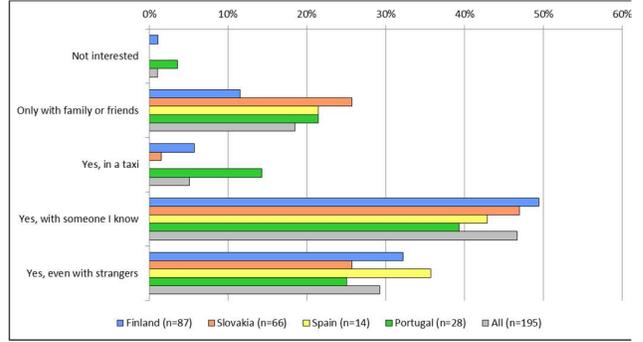


Figure 7 – All car users who could ask for a ride

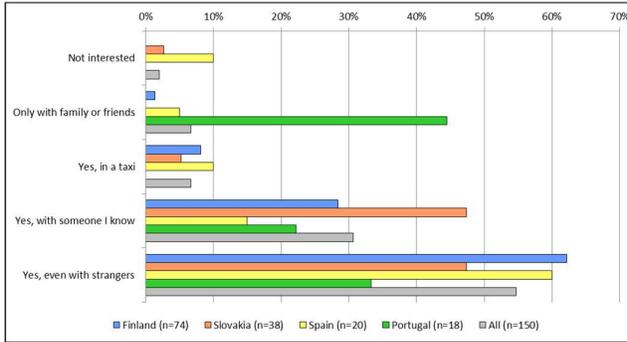


Figure 8 – All car non-users who could ask for a ride

4.1.3 Motivation to share

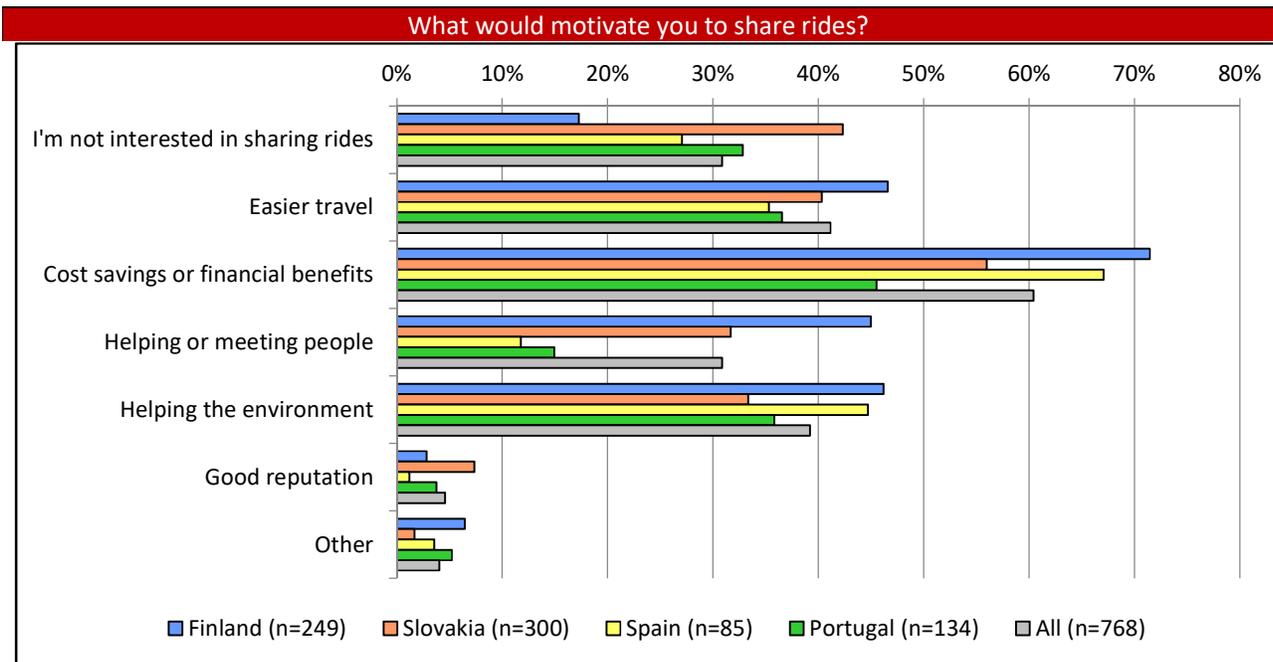


Figure 9 – All survey respondents

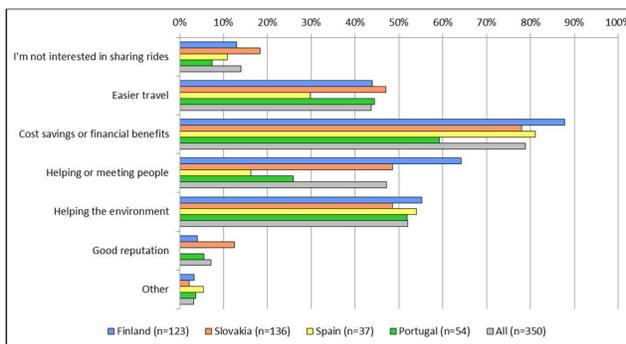


Figure 10 – All who could offer a ride

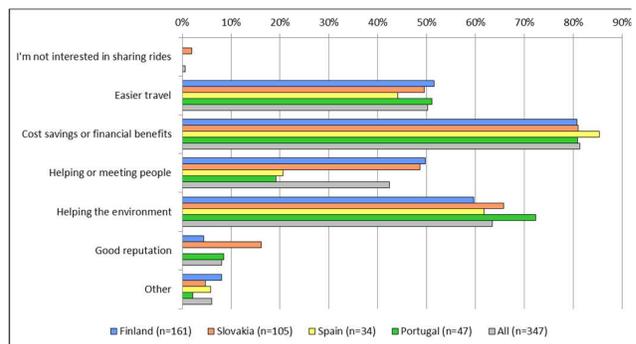


Figure 11 – All who could ask for a ride

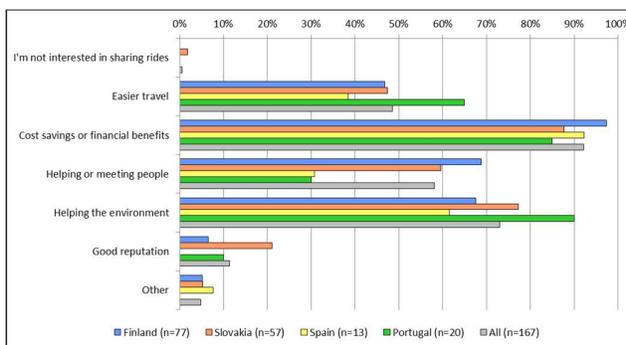


Figure 12 – All who could offer and ask for a ride

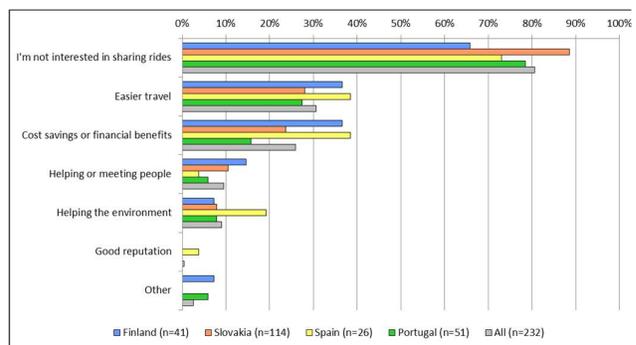


Figure 13 – All who are not interested at all

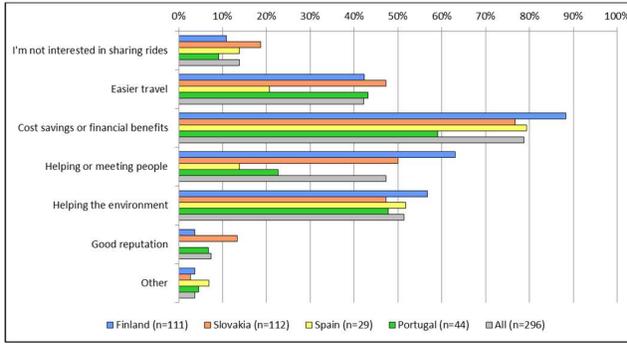


Figure 14 – All car users who could offer a ride

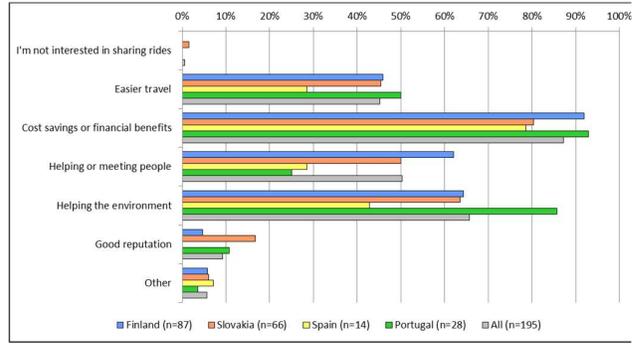


Figure 15 – All car users who could ask for a ride

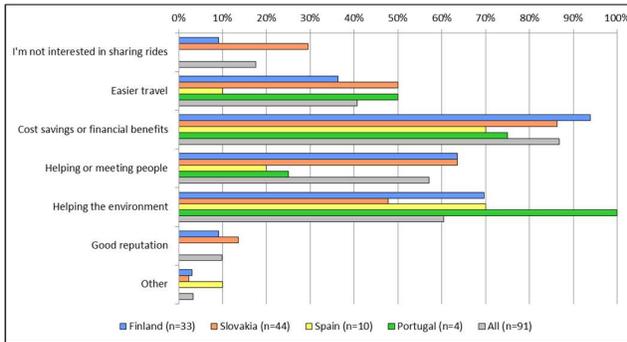


Figure 16 – All car users who could offer a ride to stranger

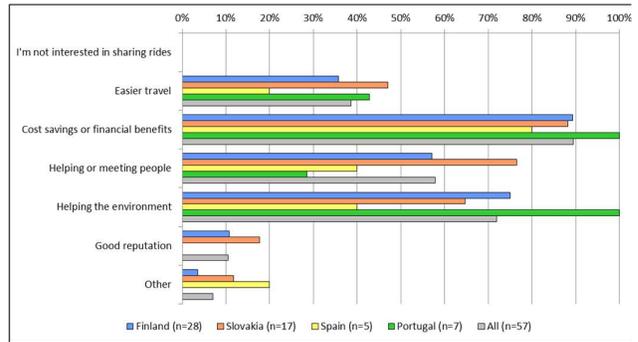


Figure 17 – All car users who could ask for a ride from stranger

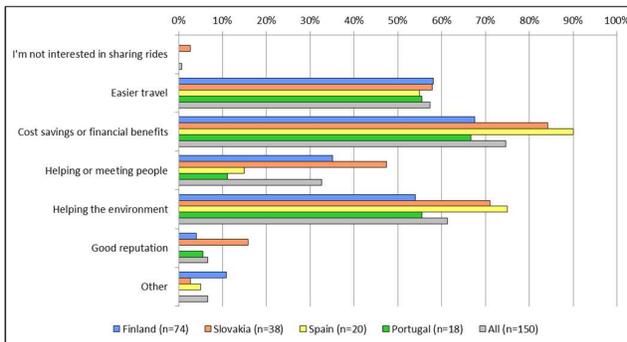


Figure 18 – All car non-users who could ask for a ride

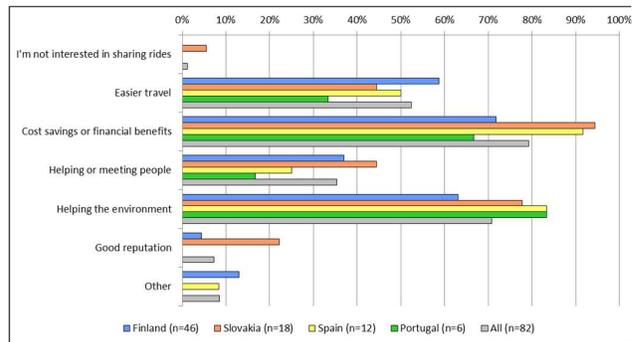


Figure 19 – All car non-users who could ask for a ride from stranger

4.1.4 Reasons not to share

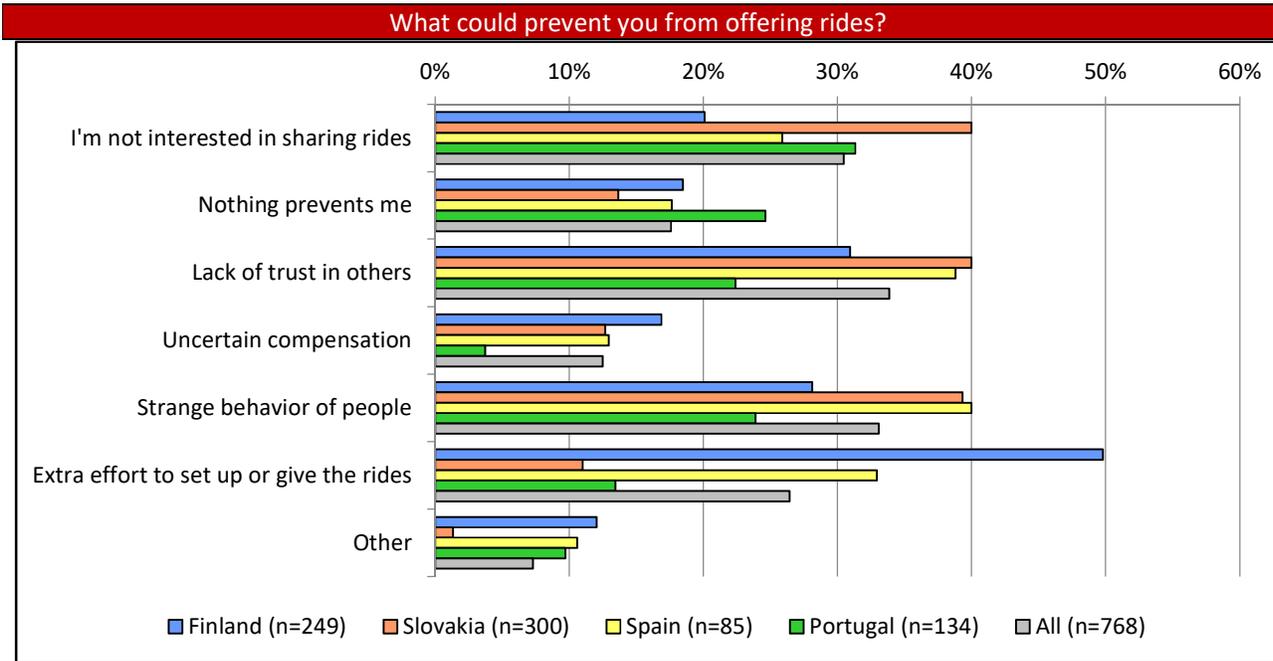


Figure 20 – All survey respondents

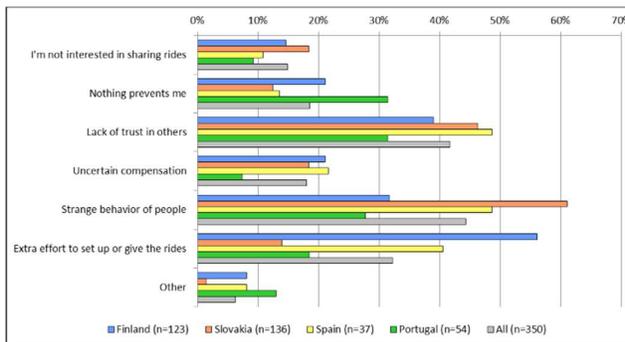


Figure 21 – All who could offer a ride

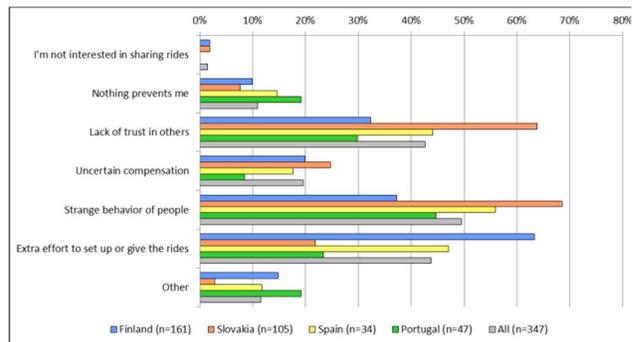


Figure 22 – All who could ask for a ride

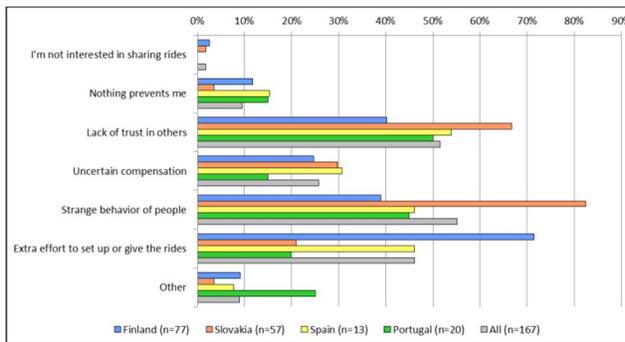


Figure 23 – All who could offer and ask for a ride

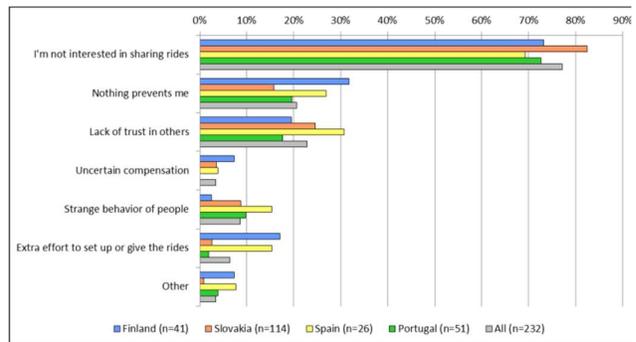


Figure 24 – All who are not interested at all

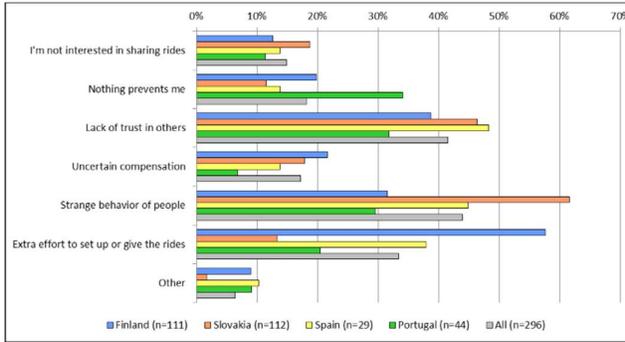


Figure 25 – All car users who could offer a ride

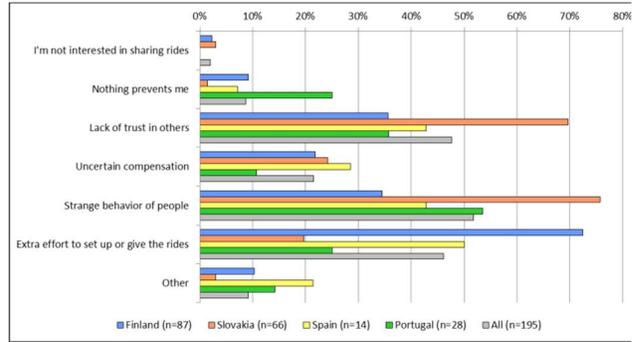


Figure 26 – All car users who could ask for a ride

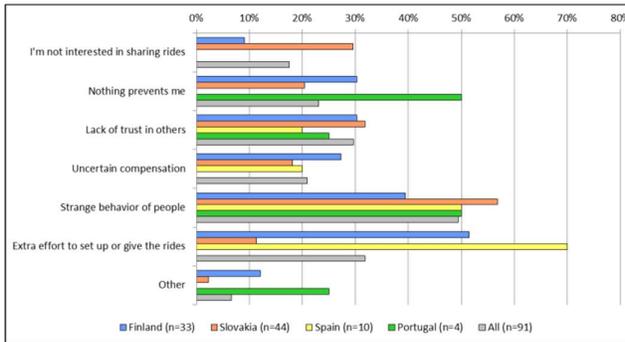


Figure 27 – All car users who could offer a ride to stranger

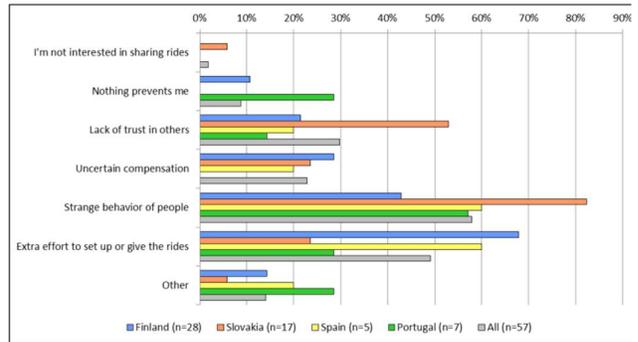


Figure 28 – All car users who could ask for a ride from stranger

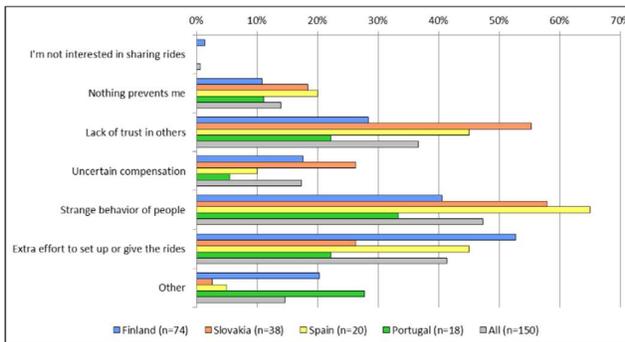


Figure 29 – All car non-users who could ask for a ride

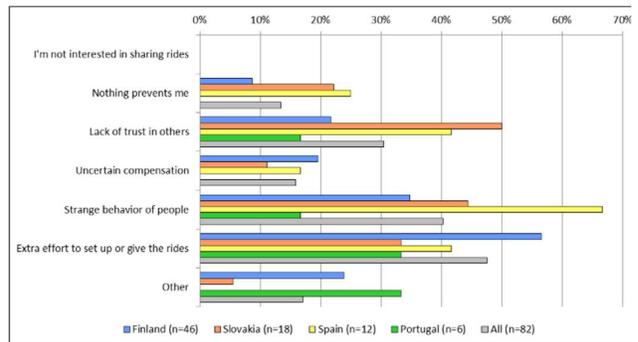


Figure 30 – All car non-users who could ask for a ride from stranger

4.1.5 Types of trips to share

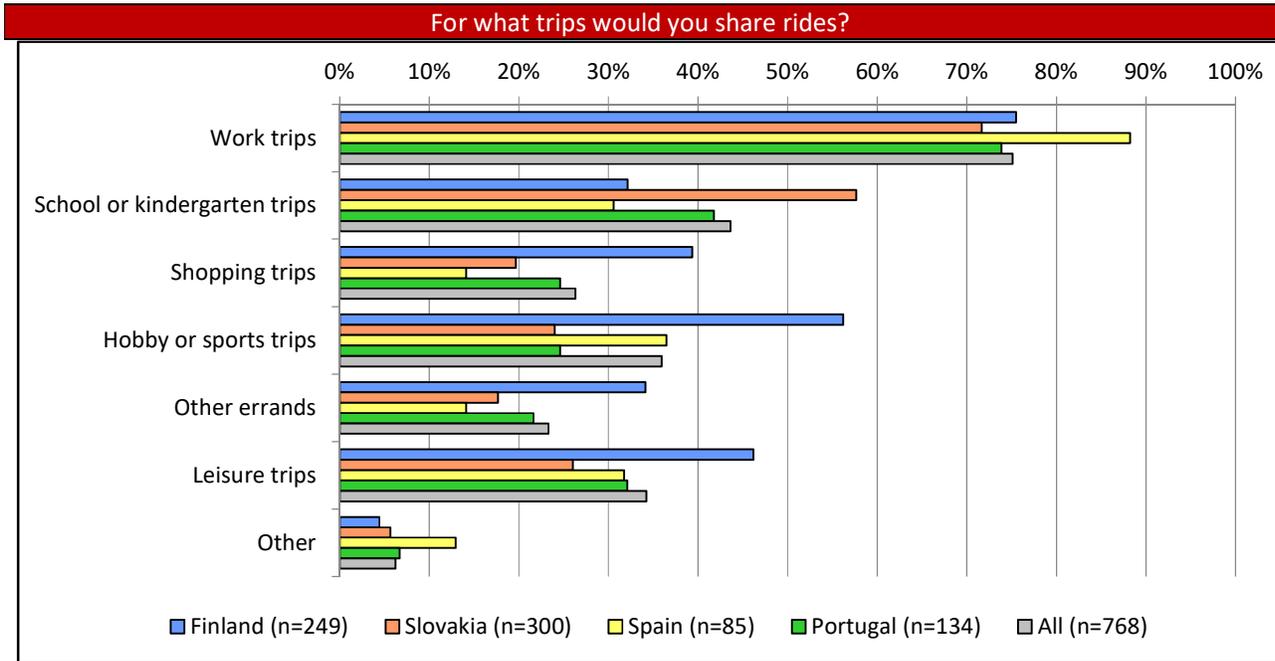


Figure 31 – All survey respondents

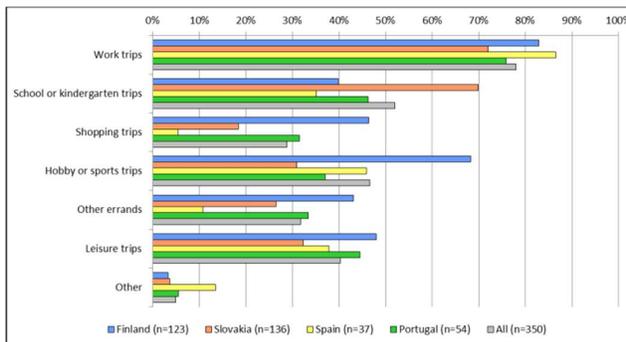


Figure 32 – All who could offer a ride

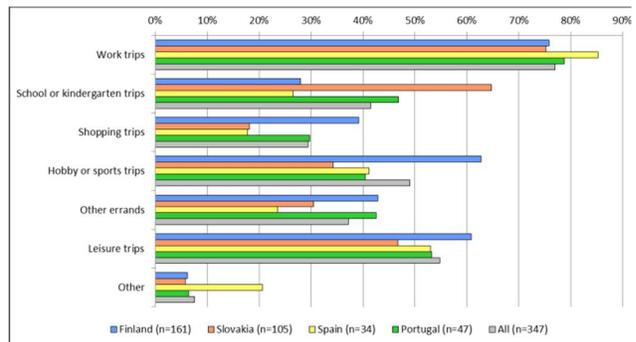


Figure 33 – All who could ask for a ride

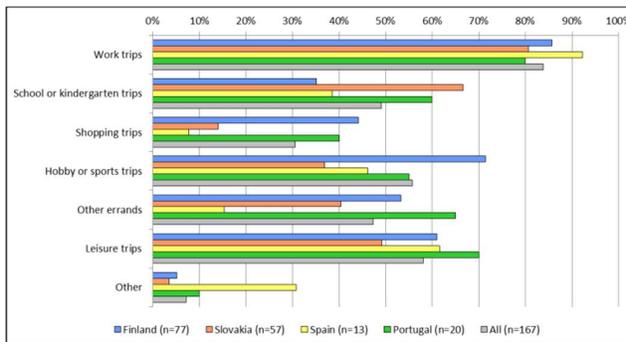


Figure 34 – All who could offer and ask for a ride

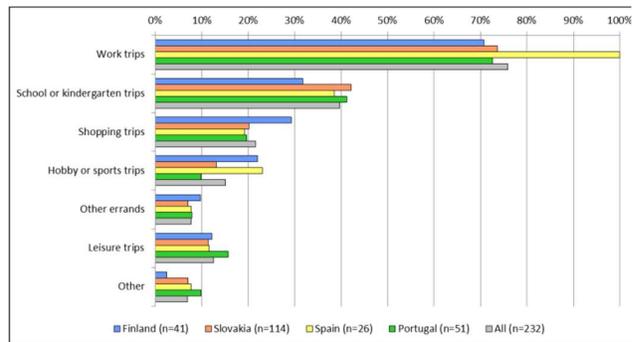


Figure 35 – All who are not interested at all

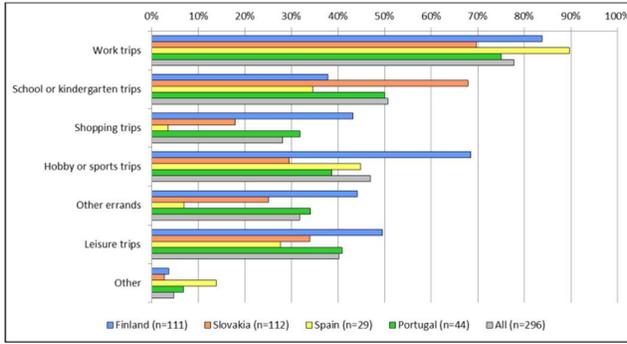


Figure 36 – All car users who could offer a ride

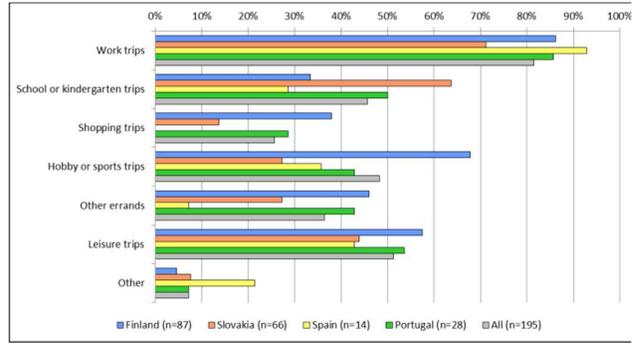


Figure 37 – All car users who could ask for a ride

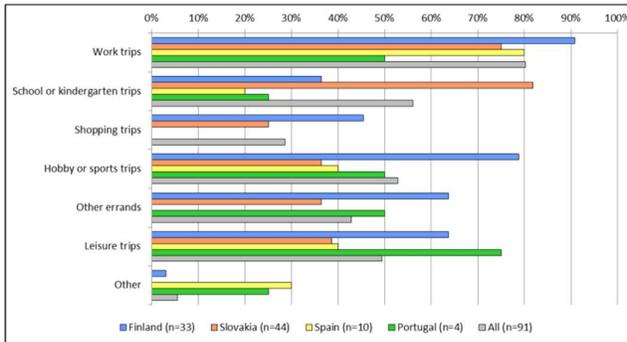


Figure 38 – All car users who could offer a ride to stranger

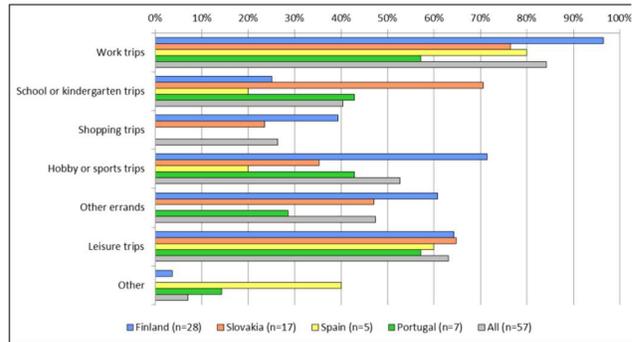


Figure 39 – All car users who could ask for a ride from stranger

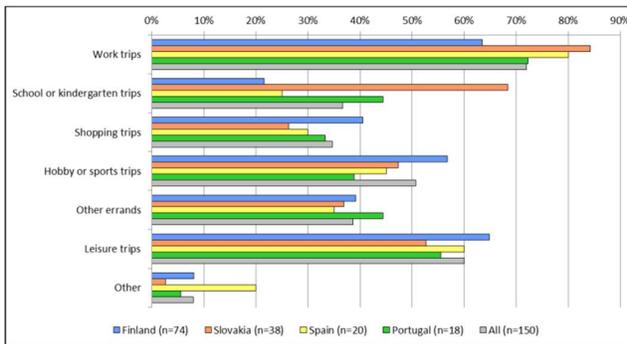


Figure 40 – All car non-users who could ask for a ride

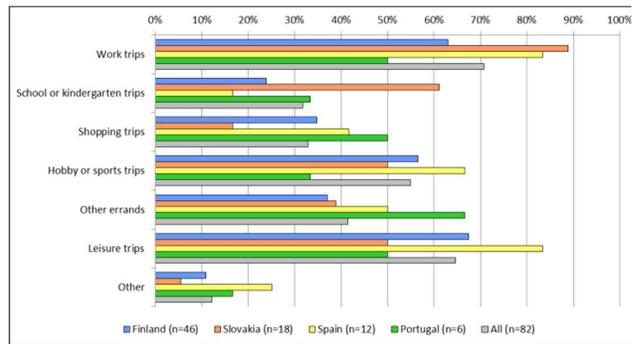


Figure 41 – All car non-users who could ask for a ride from stranger

4.1.6 Timing of trips to share

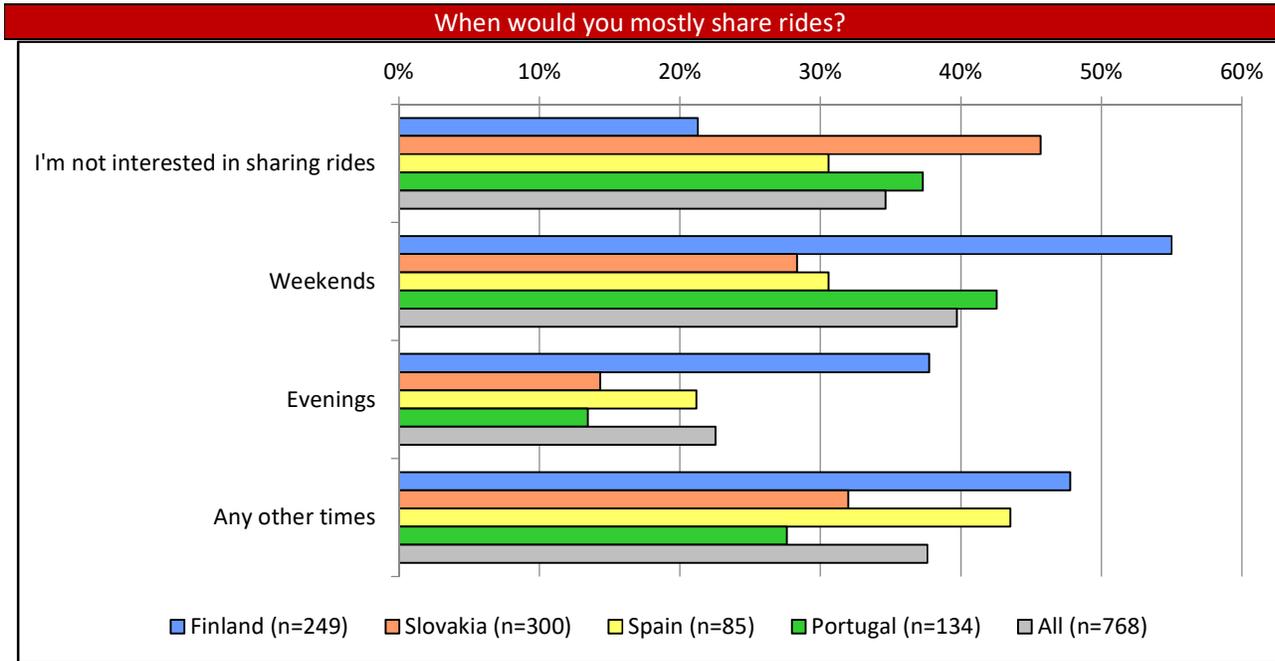


Figure 42 – All survey respondents

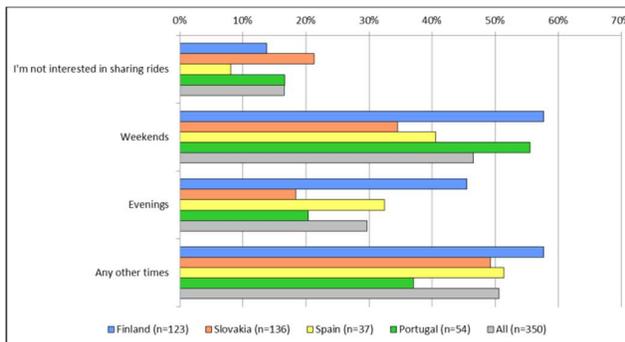


Figure 43 – All who could offer a ride

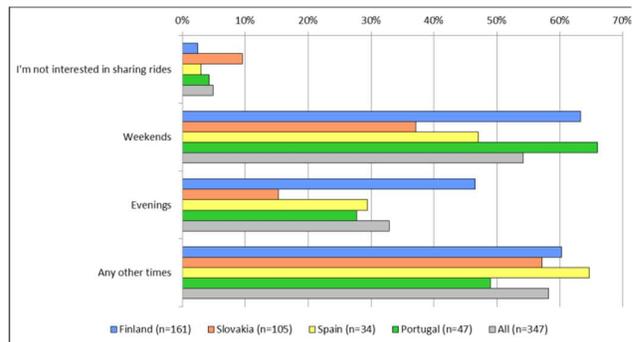


Figure 44 – All who could ask for a ride

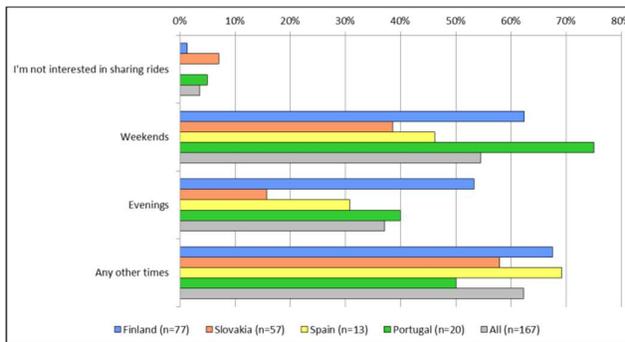


Figure 45 – All who could offer and ask for a ride

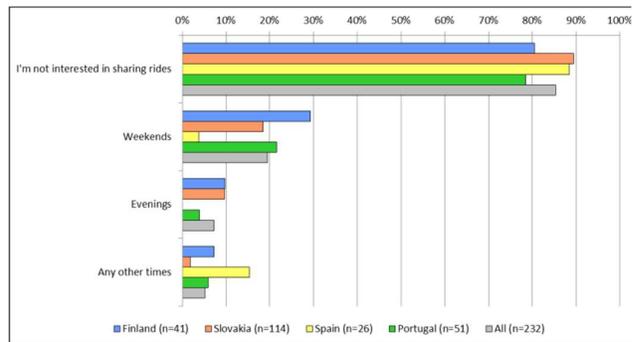


Figure 46 – All who are not interested at all

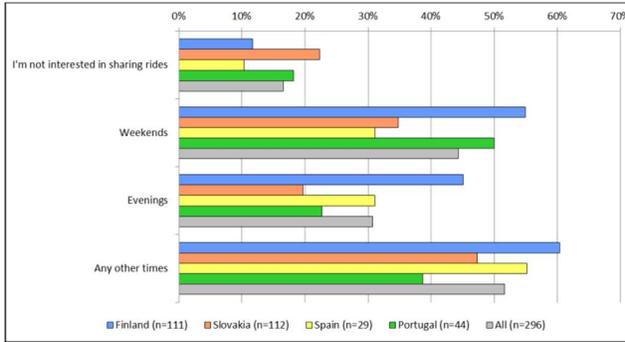


Figure 47 – All car users who could offer a ride

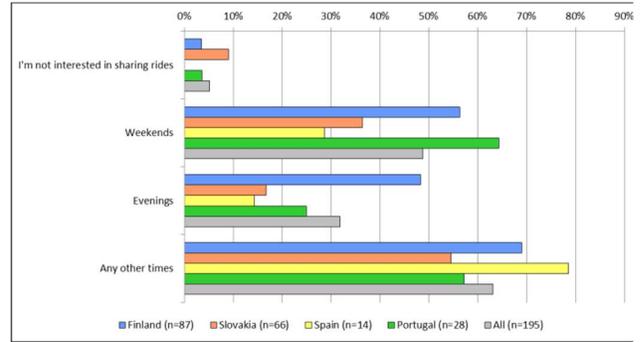


Figure 48 – All car users who could ask for a ride

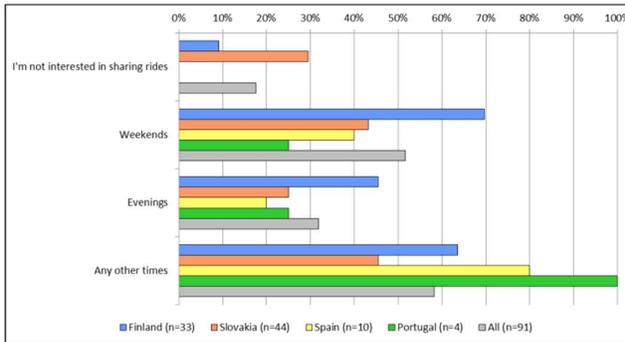


Figure 49 – All car users who could offer a ride to stranger

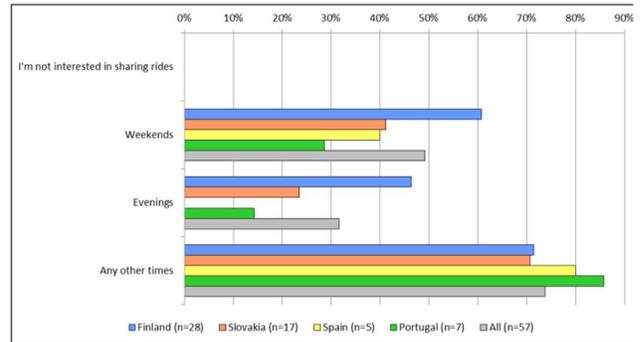


Figure 50 – All car users who could ask for a ride from stranger

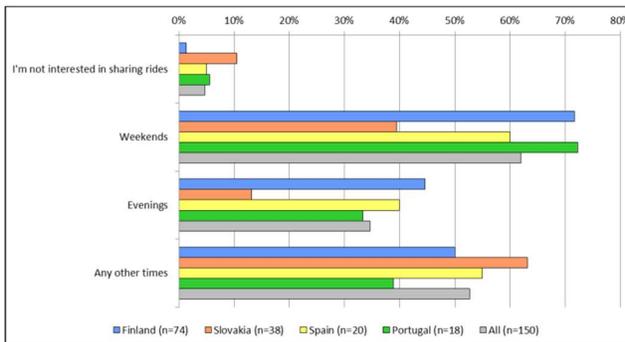


Figure 51 – All car non-users who could ask for a ride

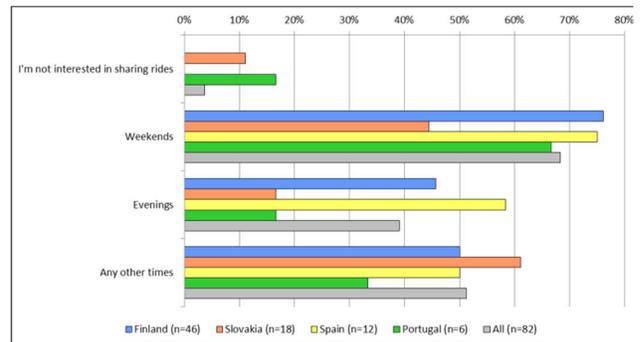


Figure 52 – All car non-users who could ask for a ride from stranger

4.1.7 Attitudes towards car use

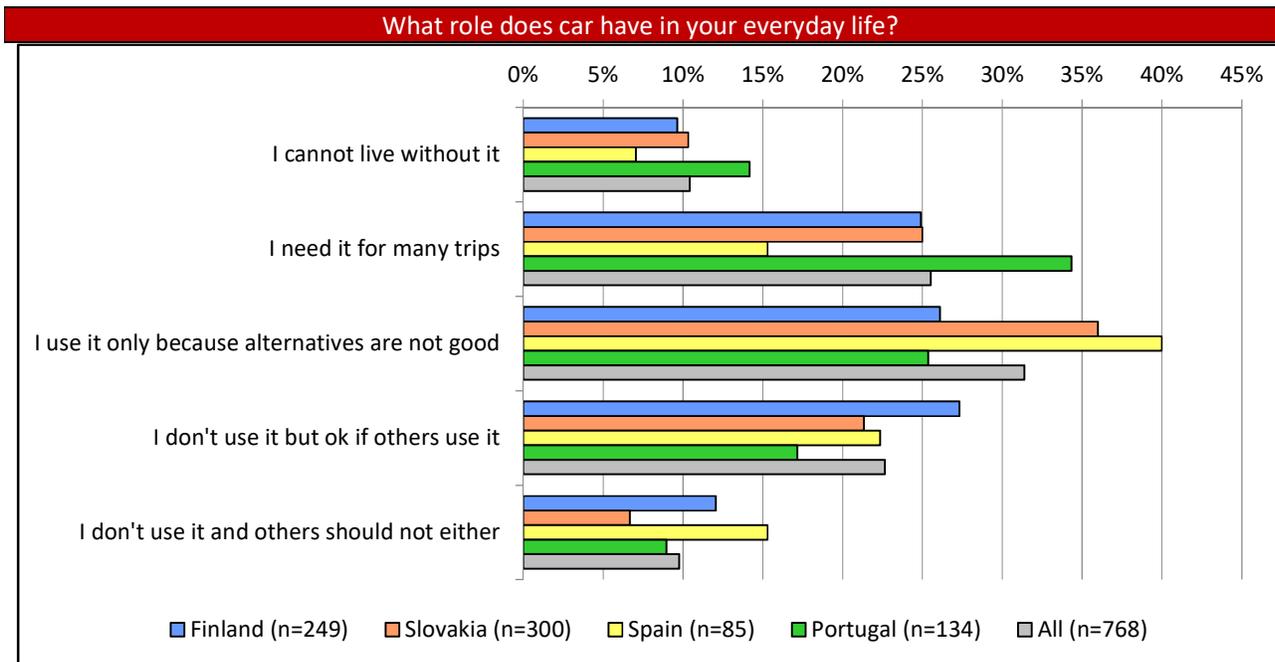


Figure 53 – All survey respondents

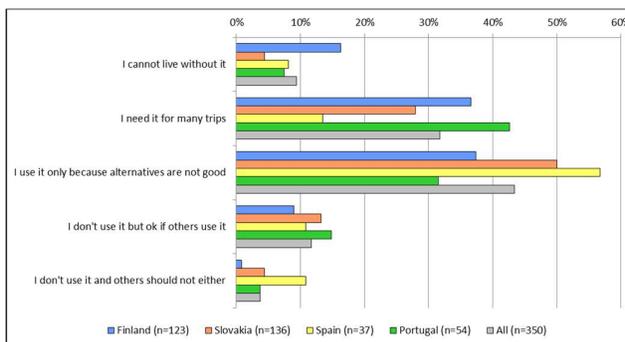


Figure 54 – All who could offer a ride

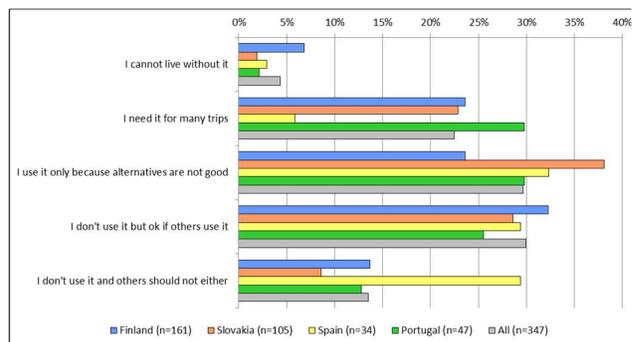


Figure 55 – All who could ask for a ride

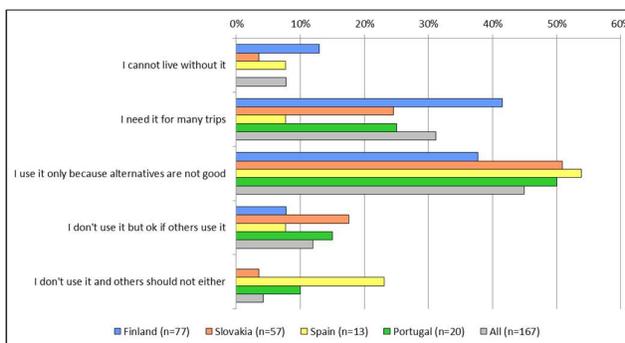


Figure 56 – All who could offer and ask for a ride

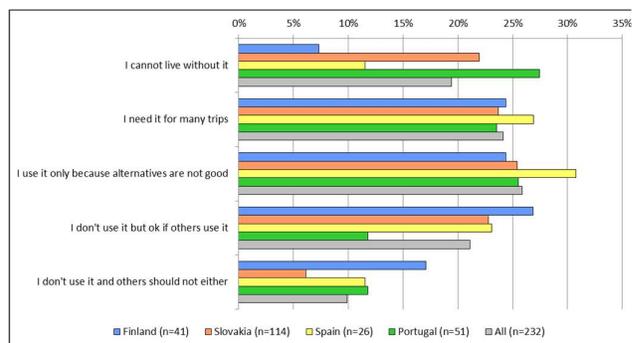


Figure 57 – All who are not interested at all

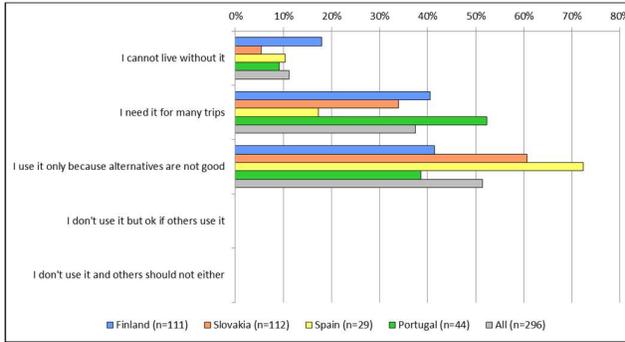


Figure 58 – All car users who could offer a ride

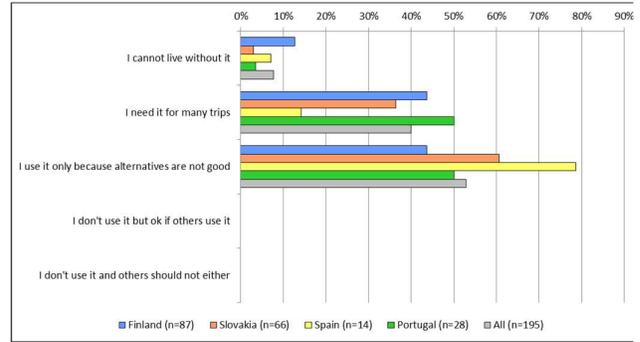


Figure 59 – All car users who could ask for a ride

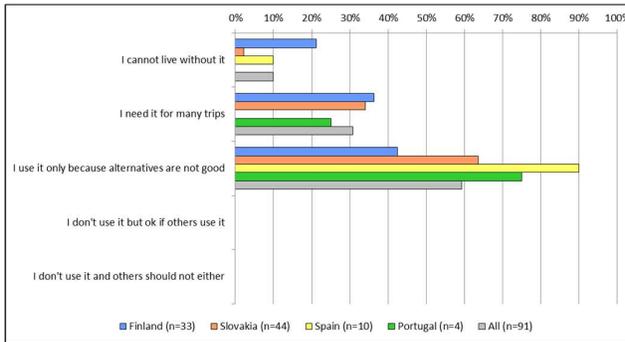


Figure 60 – All car users who could offer a ride to stranger

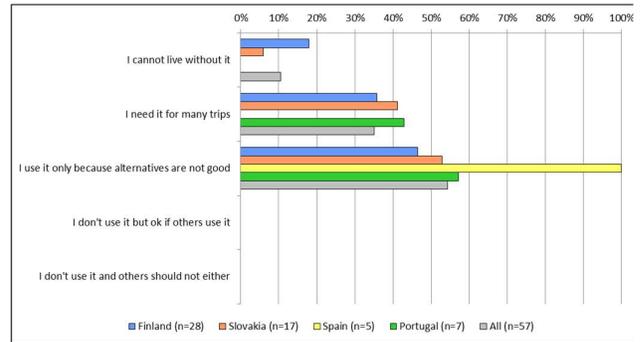


Figure 61 – All car users who could ask for a ride from stranger

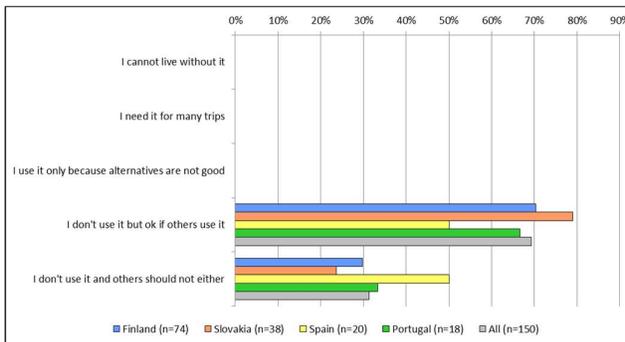


Figure 62 – All car non-users who could ask for a ride

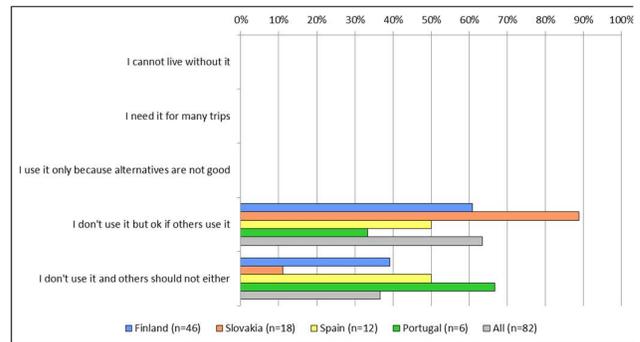


Figure 63 – All car non-users who could ask for a ride from stranger

4.1.8 Acceptable extra trip length

The absolute and relative acceptable extra trip lengths are presented in the following two tables.

	A: All	B: Could offer	C: Could ask	D: Could offer AND ask	E: Not interested at all	F: Car user, could offer	G: Car user, could ask	H: Car user, could offer to stranger	I: Car user, could ask from stranger	J: Car non-user, could ask	K: Car non-user, could ask from stranger
Finland	11.9	12.7	12.9	13.3	6.9	12.8	12.9	13.6	13.9	13.0	11.3
Slovakia	11.6	12.7	14.4	14.5	9.0	12.5	14.4	13.8	15.0	14.4	16.0
Spain	13.1	12.6	15.2	13.6	12.1	12.3	14.1	10.9	8.3	15.7	15.8
Portugal	11.2	13.5	14.0	14.8	7.1	14.0	14.7	16.0	17.1	12.6	13.1
All	11.8	12.8	13.8	14.0	8.8	12.8	13.8	13.6	14.4	13.9	13.9

Table 11 – Weighted average of the acceptable extra travel time options (minutes)

	A: All	B: Could offer	C: Could ask	D: Could offer AND ask	E: Not interested at all	F: Car user, could offer	G: Car user, could ask	H: Car user, could offer to stranger	I: Car user, could ask from stranger	J: Car non-user, could ask	K: Car non-user, could ask from stranger
Finland	13%	14%	14%	14%	8%	14%	14%	16%	17%	14%	12%
Slovakia	15%	16%	20%	19%	11%	16%	17%	17%	20%	24%	23%
Spain	15%	16%	21%	21%	9%	14%	20%	16%	30%	21%	18%
Portugal	19%	25%	25%	29%	6%	26%	24%	17%	18%	28%	23%
All	15%	17%	18%	19%	10%	16%	17%	17%	19%	21%	18%

Table 12 – Weighted average of the acceptable extra travel time options (percentage of travel time)

The average lengths, durations and speeds of trips that include a leg using car, calculated from data collected by Woorti, are presented in the following two tables for groups (as identified by the user responses to the surveys) for whom ride sharing matters most: car users and non-car users who could ask for rides.

	Number of users with trips							Average trip distance (km)						
	A: All	F: Car user, could offer	G: Car user, could ask	H: Car user, could offer to stranger	I: Car user, could ask from stranger	J: Car non-user, could ask	K: Car non-user, could ask from stranger	A: All	F: Car user, could offer	G: Car user, could ask	H: Car user, could offer to stranger	I: Car user, could ask from stranger	J: Car non-user, could ask	K: Car non-user, could ask from stranger
Finland	128	56	74	18	20	18	12	10	22	22	26	25	24	27
Slovakia	300	48	90	17	39	18	10	16	27	23	31	22	27	29
Spain	85	10	25	2	8	11	7	16	47	23	22	23	21	24
Portugal	134	21	32	5	3	5	2	9	17	18	14	16	43	15
All	490	135	221	42	70	52	31	13	25	22	26	23	26	26

Table 13 – Sample sizes for trip legs and distances for trips (km)

	Average trip duration (min)							Average trip speed (km/h)						
	A: All	F: Car user, could offer	G: Car user, could ask	H: Car user, could offer to stranger	I: Car user, could ask from stranger	J: Car non-user, could ask	K: Car non-user, could ask from stranger	A: All	F: Car user, could offer	G: Car user, could ask	H: Car user, could offer to stranger	I: Car user, could ask from stranger	J: Car non-user, could ask	K: Car non-user, could ask from stranger
Finland	34	58	60	62	69	111	97	10	23	23	28	26	17	18
Slovakia	65	182	76	89	63	90	106	13	15	21	20	25	19	19
Spain	54	158	87	59	81	65	79	13	20	19	22	22	16	15
Portugal	33	69	58	79	92	82	76	9	16	14	12	14	23	13
All	48	111	69	75	68	91	94	11	19	21	22	24	18	17

Table 14 – Average of the travel time (minutes) and speed (km/h)

The average acceptable detour (as asked in survey, weighted average of user's selected options between 5 and 30 minutes) relative to the total trip lengths (of recorded and reported trips as measured by Woorti) was then calculated. Average detours that were longer than the trips themselves (over 100% detours) were removed from the sample to limit outliers due to the Woorti measurements representing only part of the trips.

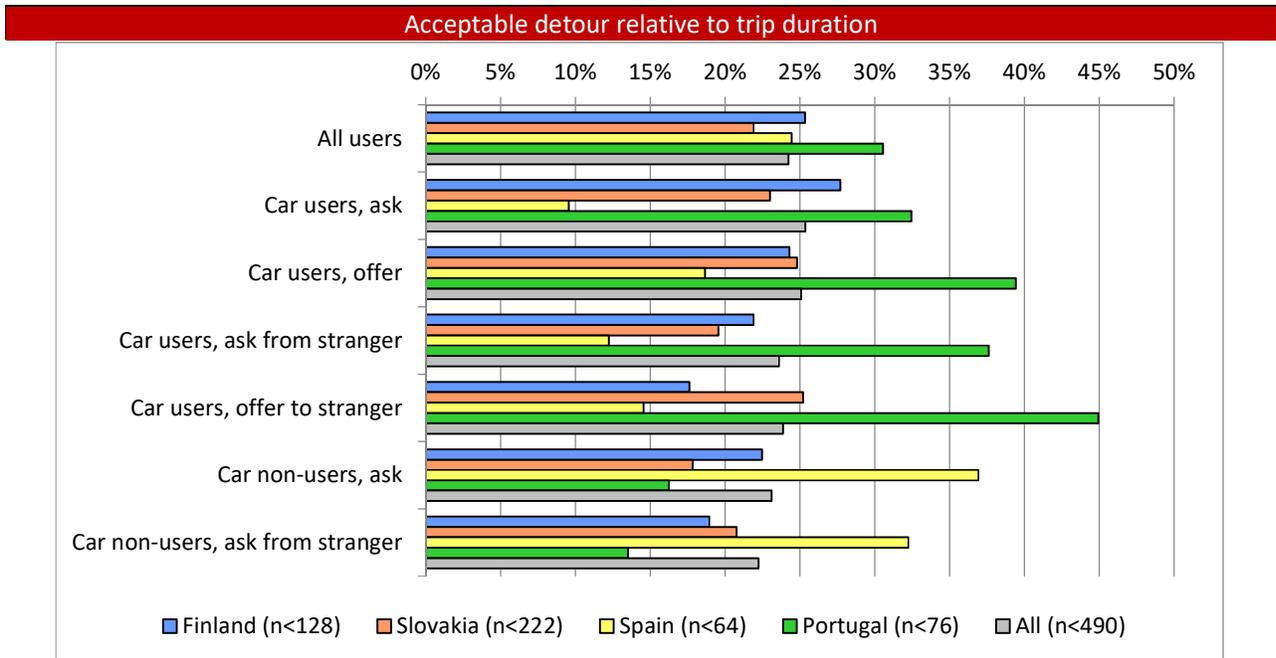


Figure 64 – Average acceptable detours relative to trip durations for Woorti user groups

4.2 Data collected from PiggyBaggy

4.2.1 Group sizes

There were 92 users who registered to PiggyBaggy between December and March when the survey contents were part of the process in their final form. Out of these, 53 users (58%) were interested in offering rides and 38 users (41%) in requesting rides. 14 users (15%) selected both “Offer rides” and “Request rides” and 15 users (16%) selected neither option.

4.2.2 Motivation to share

The answers to the motivation question were as follows. Easier travel: 17 (18%), Cost savings or benefits: 17 (18%), Helping or meeting people: 6 (7%), Helping the environment: 16 (17%), Good reputation: 5 (5%), Other: 0. However, 54 users (59%) did not select any answer option in the motivation question, whereas out of the other 38 users (41%) who did, 14 users (15% of all users, 37% of those who did answer the motivation question) selected two or more options.

If considering only those 38 users who answered the question, the answers to the motivation question were as follows. Easier travel: 17 (45%), Cost savings or benefits: 17 (45%), Helping or meeting people: 6 (16%), Helping the environment: 16 (42%), Good reputation: 5 (13%), Other: 0.

4.2.3 Acceptable extra trip length

The trip length was calculated based on home and work address data and the acceptable extra duration asked in the survey. However, only 10 users (11%) answered the trip length question (3 who only offered rides, 1 who only requested rides, and 6 who did both). Although the field was an open entry, all except one user one their own rounded their answer to 5 minutes or 10 minutes (the one who only requested ride entered 6 minutes). The

average acceptable detour for these 10 users was 8.1 minutes, which (for these users) was 25% of their average total work trip duration of 32.5 minutes. Alternatively, the acceptable detour was on average 42% if calculated from the averages of individual acceptable detours as percentage of the individual average work trip.

The average trip durations and distances are shown below.

	Average trip duration (min)							Average trip distance (km)						
	A: All	F: Car user, could offer	G: Car user, could ask	H: Car user, could offer to stranger	I: Car user, could ask from stranger	J: Car non-user, could ask	K: Car non-user, could ask from stranger	A: All	F: Car user, could offer	G: Car user, could ask	H: Car user, could offer to stranger	I: Car user, could ask from stranger	J: Car non-user, could ask	K: Car non-user, could ask from stranger
PiggyBaggy	25.1	29.5	28.8	29.5	28.8	23.2	23.2	26.9	33.2	35.1	33.2	35.1	25.0	25.0

Table 15 – Average trip durations (minutes) and distances (km)

4.2.4 Other questions

The other questions in the Woorti survey were not covered by the survey in PiggyBaggy. However, the answers can be derived from other sources.

- With whom to share: by default all the users in PiggyBaggy are prepared to share rides with strangers, because they have registered to a ride sharing service that is intended to help them do just that.
- Reasons not to share: by default all the users in PiggyBaggy are prepared to share rides, although they may have some concerns that would appear during actual usage (e.g. not accepting a ride request from a particular individual due to lack of trust, or being annoyed by the effort to arrange the ride or agree on compensation).
- Types of trips to share: by default all the users in PiggyBaggy are interested in sharing work trips. There is no information regarding their interest in other types of trips.
- Timing of trips to share: commuting (work trips) takes place before and after the workday. This is typically on weekdays during daytime, not in the evenings or weekends. The distribution of the work schedules was not included in this study.
- Attitudes towards car use: those offering rides (58%) clearly have a car and represent some Woorti survey groups (I cannot live without it, I need it for many trips, I use it only because alternatives are not good), whereas those interested in requesting rides and not offering them (26%) may represent those same groups as well as those who don't use cars themselves (I don't use it but ok if others use it). The users who selected neither "Offer rides" and "Request rides" option (16%) may be distributed across all those same groups, but most likely would not include users who are in principle against the use of cars (I don't use it and others should not either).

5. Conclusions

5.1 Analysis of results

5.1.1 Groups

The sample sizes of Woorti application and PiggyBaggy questions were not large enough for statistical significance in the case of groups that would be relevant in terms of interest and capability of participating in crowdsourced micro-tasks. In the Woorti survey:

- 296 stated that they used a car and could offer rides to others (91 of these to strangers).
- 195 stated that they used a car and could ask for rides from others (57 of these from strangers).
- 150 stated that they used a car and could ask for rides from others (82 of these from strangers).

Of all Woorti survey respondents, 46% could offer rides to others (39% of car users) and 45% could ask rides from others (25% of car users, 20% of car non-users). 29% could share rides with (offer to or ask rides from) strangers and 53% with family, friends or someone they know. 5% could share rides in a taxi while only 13% were not interested in sharing at all. These indicate that in principle people have positive attitudes towards ride sharing.

Of all Woorti survey respondents, the groups for those who could offer rides, ask for rides, or do both were about the same size (24%-23%-22%). This increases the probability of finding ride sharing matches.

Of all Woorti survey respondents, 6% answered that they could both offer and ask for rides but were not interested in doing so. 13% were not interested in sharing when asked about whom to share rides with, but 30-35% were not interested in sharing when answering more specific questions that required thinking about the practicalities of ride sharing. These indicate that answers are somewhat ambiguous and may vary depending on the context, circumstances and other factors.

5.1.2 Countries

The sample sizes of country specific Woorti application surveys were over 100 only in Finland and Slovakia for groups of respondents who could offer rides, ask for rides, and car users who could offer rides. Regardless of this, some comparisons can be made.

65% of all respondents in Finland could ask for rides, compared to 35-40% in other countries. Car using respondents in Finland were also more likely to both offer rides or ask for rides (8-12 and 14-19 percentage point differences to similar groups in other countries, respectively). 39% of all respondents in Finland stated that they could share rides with strangers (27% in Slovakia, 31% in Spain and 13% in Portugal). In terms of motivations, 45% in Finland wanted to meet or help others (32% in Slovakia, 12% in Spain and 15% in Portugal). In Finland Woorti users were recruited by stakeholders (mostly cities and municipalities) on a completely voluntary basis and due to this may have been more motivated to contribute to social issues or transport solutions.

39% of respondents in Portugal who could offer rides would limit that to family and friends (14% in Finland, 15% in Slovakia, 11% in Spain). 30% of respondents in Portugal who could ask for rides would limit that to family and friends (7% in Finland, 16% in Slovakia, 12% in Spain). This could indicate real cultural differences and considerations of the value of travel time that justifies the effort involved in ride sharing, which affects the potential of ride sharing.

65% of all respondents in Finland were concerned of the extra effort to set up or give the rides (compared to 11% in Slovakia, 33% in Spain and 13% in Portugal). With car users who could offer rides, the numbers were similar (58% in Finland, 13% in Slovakia, 38% in Spain and 20% in Portugal; the sizes of these groups in Spain and Portugal were quite low at n=29 and n=44, respectively). Some of this could be due to the larger share of respondents in Finland thinking about offering rides to strangers instead of family, friends or people they know, which would reflect their awareness of the travel time and value trade-offs.

The willingness of respondents in Finland to share rides on occasional trip types (shopping, hobby, errands, leisure) and weekends or evenings was 10-30 percentage points higher than in other countries. In addition to the reasons already presented, this could be due to most of the respondents being from various smaller Finnish cities and municipalities instead of larger cities, resulting in a better awareness that ride sharing could address everyday transport challenges in those areas where there are not many good public transport or other mobility options (especially during late autumn when the survey was active).

40% of all respondents in Spain and 36% in Slovakia use cars only because alternatives are not good (compared to 26% in Finland and 25% in Portugal). On the other hand, car was very important for 48% of all respondents in Portugal (compared to 35% in Slovakia and Finland and 22% in Spain). On the other side of the spectrum, 15% of all respondents in Spain and 12% in Finland were not using car themselves and also against others using cars (compared to 7% in Slovakia and 9% in Portugal). It seems that the importance of cars varies a lot by region.

5.1.3 Hypotheses

The following findings can be derived from the results in relation to the MoTiV hypotheses.

#1: Door-to-door time

“Easier travel” was a reason to do ride sharing for 41% of all respondents (35-47% by country), 42% for car users who could offer a ride and 45% for car users who could ask for a ride (21% and 29% in Spain, although with small group size). This is indicative that car users are emphatically thinking of the passengers that they are helping, rather than themselves. “Easier travel” was a reason to do ride sharing for 57% of those without car who could ask for rides.

Faster travel clearly affects the interest to select ride sharing as the travel choice. However, it was still lower than “Cost savings or financial benefits” (60% of all respondents and 75% of those without car who could ask for rides) and not significantly above “Helping the environment” (39%) and “Helping or meeting people” (31%).

This is indicative that the value of travel time is affected by other (cost, sustainability and social) considerations in addition to speed and effort.

#2: Reliable door-to-door time

“Lack of trust in others” was a reason that could prevent ride sharing for 34% of all respondents (22-40% by country), 42% for car users who could offer a ride, 48% for car users who could ask for a ride and 37% for car non-users who could ask for a ride. This referred to reliability of the schedule and the trip happening, because there was a separate answer option “Strange behaviour of people” as well (of concern to 33% of all respondents).

	<p>Reliability clearly affects the interest to select ride sharing as the travel choice. There were also regional differences, for example in Slovakia 64% of respondents who could ask for a ride were concerned with “Lack of trust in others” and 69% with “Strange behaviour of people” (15-30 percentage points higher than in other countries).</p> <p>Reliability was also a more important reason than “Extra effort to set up or give the rides” (26%) and “Uncertain compensation” (13%), which are directly related to the overall travel time and monetary value of the travel.</p>
#3: Trip planning time	<p>“Extra effort to set up or give the rides” was a reason that could prevent ride sharing for 26% of all respondents (with significant variance by country: Slovakia 11%, Portugal 13%, Spain 33%, Finland 50%), 33% for car users who could offer a ride, 46% for car users who could ask for a ride and 41% for car non-users who could ask for a ride.</p> <p>The trip planning effort clearly affects the interest to select ride sharing as the travel choice (especially for car non-users this is the main extra effort). It is also important to note that the level of concern is highest for car users who could ask for a ride (instead of driving themselves with their own car).</p>
#4: Time constraints	<p>Respondents were more interested in sharing rides for trips with typically harder time constraints and consequences in case of being late (75% for work trips or commuting, 44% for school or kindergarten trips) than for trips with typically more relaxed time constraints (26% shopping trips, 36% hobby or sports trips, 23% other errands, 34% leisure trips).</p> <p>This indicates that at least when thinking of ride sharing hypothetically (instead of deciding on whether to do it for a specific concrete trip), people do not focus on the time constraints as much as the frequency of trips for which they could consider adopting ride sharing as the travel choice (i.e. its impact and importance on their lives).</p>
#6: Travel time budgets	<p>For all groups respondents who were interested in ride sharing (who did not select “Not interested” in question 2), the absolute amount of extra trip length time acceptable to them (weighted average of selected options) varied very little, ranging from 12.8 to 14.4 minutes (those who were “Not interested” has a lower tolerance at 8.8 minutes). Those that could offer a ride had a slightly lower amount (12.8 minutes) than those who could ask for a ride (13.8 minutes). But still the differences were surprisingly low.</p> <p>In relation to the overall trip length, the acceptable extra time was 16.6% (for those who could offer rides) or 18.4% (for those who could ask for rides). These would imply overall trip lengths of 77 minutes (for those who could offer rides) and 75 minutes (for those who could ask for rides).</p> <p>The daily Travel Time Budget (TTB) could therefore be increased by 13.3 minutes on average, or 26.6 minutes if ride sharing was used in</p>

	<p>two trips per day (e.g. commuting to and from work). However, this would imply a maximum daily TTB of 90 minutes (one way) or 3 hours (two ways), which is unlikely. Therefore the actual acceptable extra travel times would probably be much lower in real life.</p>
<p>#11: Unwanted efforts</p>	<p>As already described in the hypotheses 2 and 3, the concern that respondents have of the unwanted cognitive and emotional efforts that could be involved with ride sharing clearly affects the interest to select it as the travel choice. These concerns (“Lack of trust in others” 34%, “Strange behaviour of people” 33% and “Extra effort to set up or give the rides” 26%) were higher than concerns about the main motive to do ride sharing (“Cost savings or financial benefits” as motive for 60% of all respondents with 13% concerned about “Uncertain compensation”), and were at a similar level as the other motivations to do ride sharing (41% “Easier travel”, 39% “Helping the environment” and 31% “Helping or meeting people”).</p> <p>This indicates that for ride sharing to be adopted in larger scale, it is equally important to address the concerns about unwanted efforts as it is to ensure that it addresses the motivational drivers of the participants.</p>

Table 16 – Findings related to the research hypotheses investigated with the surveys

5.1.4 Validation with PiggyBaggy

The absolute and relative sizes of the groups are presented in the following two tables using the same grouping as in the Woorti survey. It should be noted that the question on car ownership was not required in the PiggyBaggy registration, but in practice all the users who are offering rides are car users. Therefore, the numbers in group B are equivalent to those for groups F and H. Furthermore, those who are interested in offering rides can be expected to be car users, which allows us to form the numbers also for car users who could ask for rides (G) and non-car-users (J, K). Surprisingly, many users who registered to the PiggyBaggy service did not select either offering or asking for rides, and therefore they are considered equivalent to group E in the table, although they clearly are in principle interested, just not currently.

Because the PiggyBaggy users have already made the conversion from a potentially interested to an active user, and we cannot determine the conversion rate of the Woorti survey users, we can only compare the relative share of users in the groups. The size of the groups relative to the most relevant reference group is also shown.

It should be also noted that the PiggyBaggy sample size (92) was lower than in Woorti (249).

	A: All	B: Could offer	B1: Could offer only	C: Could ask	C1: Could ask only	D: Could offer AND ask	E: Not interested at all	None: Could offer AND not interested	None: Could ask AND not interested	F: Car user, could offer	G: Car user, could ask	H: Car user, could offer to stranger	I: Car user, could ask from stranger	J: Car non-user, could ask	K: Car non-user, could ask from stranger
Finland/Woorti	249	123	46	161	84	77	41	16	1	111	87	33	28	74	46
PiggyBaggy	92	53	39	38	24	14	15	-	-	53	14	53	14	24	24

Table 17 – Group sizes in Finland in absolute number of respondents

	A: All	B: Could offer	B1: Could offer only	C: Could ask	C1: Could ask only	D: Could offer AND ask	E: Not interested at all	F: Car user, could offer	G: Car user, could ask	H: Car user, could offer to stranger	I: Car user, could ask from stranger	J: Car non-user, could ask	K: Car non-user, could ask from stranger
Finland/Woorti	100%	49%	18%	65%	34%	31%	16%	45%	35%	13%	11%	30%	18%
PiggyBaggy	100%	58%	42%	41%	26%	15%	16%	58%	15%	58%	15%	26%	26%
			B1/B	C/B	C1/C	D/B	E/B	F/B	G/C	H/F	I/G	J/C	K/J
Finland/Woorti	-	-	37%	131%	52%	63%	33%	90%	54%	30%	32%	46%	62%
PiggyBaggy	-	-	74%	72%	63%	26%	28%	100%	37%	100%	100%	63%	100%

Table 18 – Group sizes in Finland relative to all survey respondents

The primary finding from this comparison is that the conversion of car users who are interested in offering rides to actual users of a ride sharing service was higher than that of users who are interested in requesting rides. Due to this, also the share of users who are ready to offer AND ask for rides is significantly lower in the PiggyBaggy actual users (26% vs. 63%). Also the conversion has a direct impact to the readiness to share rides to strangers, where it was the default for those registering to the ride sharing service and optional for those responding to the Woorti survey (3 and 1.5 times higher share for car users and car non-users, respectively).

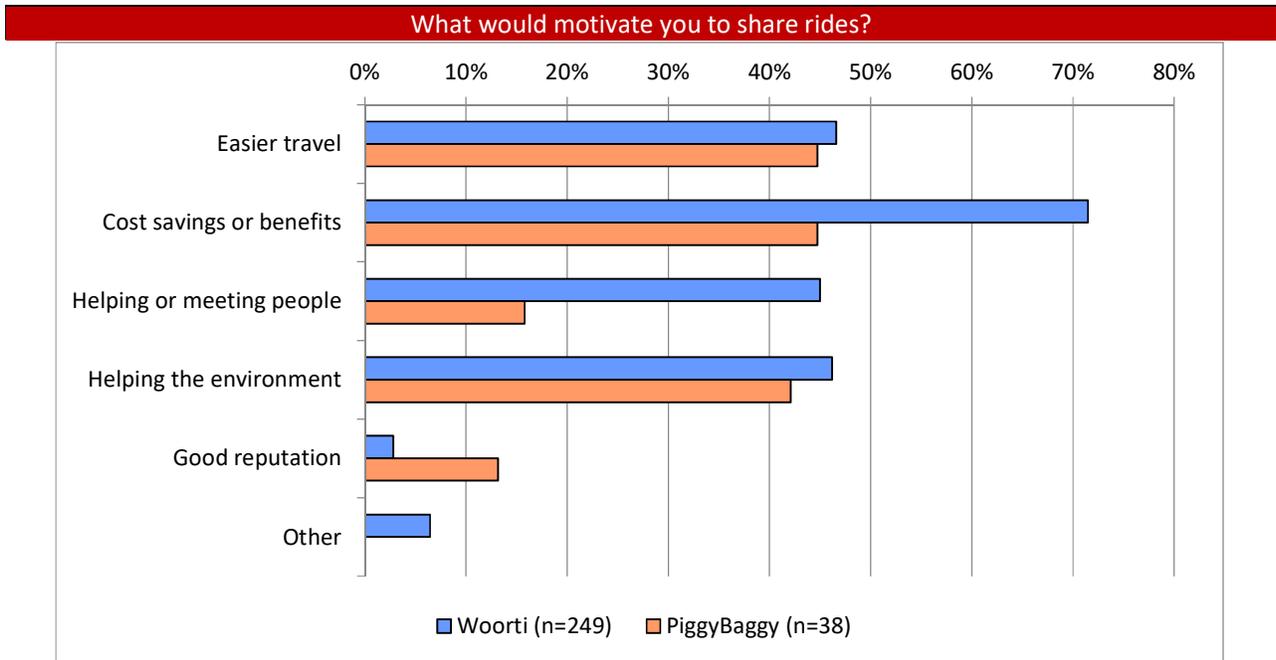


Figure 65 – Motivations for all survey respondents in Finland

Easier travel and ability to help the environment are almost equally important motives for both Woorti and PiggyBaggy users. However, the financial and social motives are both significantly less important for PiggyBaggy users who have actually decided to engage in ride sharing, compared to Woorti users who are just thinking about it when asked. This variation could be due to the small sample size in PiggyBaggy, or because those who have decided to share rides are more realistic of how much they will save and how probably or frequently they would actually help or meet with people.

The average acceptable detour for Woorti users in Finland varied between 18% and 28% of the total trip duration. This is in line with the average of the 10 PiggyBaggy users of 25% but below the 42% if calculated from the averages of individual acceptable detours as percentage of the individual average work trip. If anything, then the PiggyBaggy users demonstrate a higher tolerance for detours than Woorti survey respondents.

The Woorti trip distances were slightly longer and durations significantly higher than the work trips of PiggyBaggy users. Consequently, the Woorti trips were significantly slower, which could be partially explained by the less efficient parts of the car trip that were not included in PiggyBaggy duration calculations (going to the car, finding a parking space, walking to the work location).

Overall, the data collected from the 92 PiggyBaggy users was a relatively small sample but did not directly invalidate any specific Woorti survey responses. Whereas financial and social motives are strong before starting ride sharing, once a person has joined the service as an everyday transport option, their importance is reduced.

Unfortunately, this comparison could not determine the most critical parameter for assessing the possible impacts achievable with crowdsourced micro-tasks in transport: the actual conversion rates of people considering participation in such shared transport into everyday users of the related services.

	Average trip duration (min)							Average trip distance (km)						
	A: All	F: Car user, could offer	G: Car user, could ask	H: Car user, could offer to stranger	I: Car user, could ask from stranger	J: Car non-user, could ask	K: Car non-user, could ask from stranger	A: All	F: Car user, could offer	G: Car user, could ask	H: Car user, could offer to stranger	I: Car user, could ask from stranger	J: Car non-user, could ask	K: Car non-user, could ask from stranger
Woorti	34	58	60	62	69	111	97	10	22	22	26	25	24	27
PiggyBaggy	25	30	29	30	29	23	23	27	33	35	33	35	25	25

Table 19 – Average trip durations (minutes) and distances (km) in Finland

5.2 Recommendations

57% of people without cars and 41% of people with cars think that ride sharing would make travelling easier. However, in order to improve the efficiency and sustainability of the transport system by having more people actually share rides, it is also necessary to:

1. Ensure that they receive the expected cost savings or financial benefits (motive for 60%, or 75% if no car);
2. Ensure that the unwanted efforts (arranging the ride and establishing reliability) are minimized; and
3. Remind them of the additional sustainability and social benefits (motive for 39% and 31%).

75% of people consider ride sharing to be suitable for work trips or commuting and 44% for school or kindergarten trips. It is therefore easier to improve the efficiency and sustainability of the transport system by having more people actually share rides, because the communications can focus on these most frequent trip types and can work through the employers and educational organizations to reach the potential users.

When communicating about ride sharing to car drivers, even 10 minutes of extra travel time per trip is below the average perceived acceptable extra travel time ranging from 12.8 to 14.4 minutes. This makes it easier to get people to at least try ride sharing, because it is possible to use examples where the detours and pick-up and drop-off of the passenger can take a realistic amount of time.

There are significant differences towards attitudes on ride sharing depending on the region in Europe. Therefore, the communications must be adjusted to local cultural preferences, such as emphasizing in some regions that ride sharing with friends or people you already know is good enough as long as you do it, and in other regions that by giving rides to others you could be of great help to them.

To estimate the potential **impact on an individual's VTT**, we can observe that if a car user would be potentially interested in giving a ride to someone else, then they could accept, a detour of on average up to 5-10 minutes or 15-25% of the total trip duration.

To estimate the potential **overall impact on transport system**, we can first observe that in all countries roughly the same amount of people were interested in offering (46%) as asking for rides (45%). Therefore, if we can motivate a driver to offer a ride then we could potentially find an equivalent number of people to share that ride. 57% of those asking for rides are car users (group G) and 43% car non-users (group J). Therefore, every offered car ride could potentially cause a reduction of 28.5% of overall car trips.

We must next determine the likelihood of the car users offering rides to anyone outside their family and immediate friends and finding people who would be interested in joining them in those trip types. If we only look at car users, then 61% across the different countries were ready to offer rides to people they know or strangers. By multiplying this with the overall interest of people sharing rides on different types of trips, and the car trip reduction we can see the savings potential on car use by trip type. This is shown in table 20 below.

	Interest to share rides by trip type							Potential impact on car trips by trip type						
	% of car users who could offer a ride to someone they know or a stranger	Work trips	School or kindergarten trips	Shopping trips	Hobby or sports trips	Other errands	Leisure trips	Potential reduction of car trips	Work trips	School or kindergarten trips	Shopping trips	Hobby or sports trips	Other errands	Leisure trips
Finland	69%	76%	32%	39%	56%	34%	46%	20%	15%	6%	8%	11%	7%	9%
Slovakia	63%	72%	58%	20%	24%	18%	26%	18%	13%	10%	4%	4%	3%	5%
Spain	70%	88%	31%	14%	36%	14%	32%	20%	18%	6%	3%	7%	3%	6%
Portugal	42%	74%	42%	25%	25%	22%	32%	12%	9%	5%	3%	3%	3%	4%
All	61%	75%	44%	26%	36%	23%	34%	17%	13%	8%	5%	6%	4%	6%

Table 20 – Estimated potential impact of crowdsourced micro-tasks as reduction of traffic amounts per trip type

We can see that the potential reduction of an average car trip (across all 4 countries) is 17% if we assume that every car user who offers the trip also finds someone to share the ride. If we take into account the variations in the interest of car users to offer rides on certain types of trips, and the interest of other car users to share the ride on that kind of trip, the reduction varies from 3% to 18% depending on the trip type and country. However, it will take time before this potential can be achieved because it requires widespread adoption of the means to share rides and the culture of doing so in everyday mobility among the car users who are potentially interested in it.

The cost to achieve this impact at the level of an individual is low to none because of non-monetary motivational factors, and because the monetary motivational factors being primarily direct cost savings of the costs of using a car or an alternative transport mode (i.e. the impact could be achieved without external financial inputs. At the level of the transport system, the cost to achieve this impact is the investment in the technical means to enable ride sharing across all the different trip types, and roll-out projects to create use experiences that can solve the barriers to adoption and the difference between strangers and already known people. These are what CoReorient is trying to achieve together with the Finnish cities and municipalities.

Annex 1: Woorti and PiggyBaggy questions

Could you share rides with other people?	<ul style="list-style-type: none"> Not interested Only with family or friends Yes, in a taxi Yes, with someone I know Yes, even with strangers
How could you share rides with others?	<ul style="list-style-type: none"> Not interested I could offer a ride I could ask for a ride
What would motivate you to share rides?	<ul style="list-style-type: none"> I'm not interested in sharing rides Easier travel Cost savings or financial benefits Helping or meeting people Helping the environment Good reputation Other
What could prevent you from offering rides?	<ul style="list-style-type: none"> I'm not interested in sharing rides Nothing prevents me Lack of trust in others Uncertain compensation Strange behavior of people Extra effort to set up or give the rides Other
For what trips would you share rides?	<ul style="list-style-type: none"> Work trips School or kindergarten trips Shopping trips Hobby or sports trips Other errands Leisure trips Other
When would you mostly share rides?	<ul style="list-style-type: none"> I'm not interested in sharing rides Weekends Evenings Any other times
How much longer (min) could your trip be if offering rides?	<Number>
How much longer (%) could your trip be if offering rides?	<Number>
What role does car have in your everyday life?	<ul style="list-style-type: none"> I cannot live without it I need it for many trips I use it only because alternatives are not good I don't use it but ok if others use it I don't use it and others should not either

Table 21 – Woorti survey questions and answer options

Offer rides Request rides	Multiple choice (select one or both tick box answer options)
Additional route for a ride Acceptable detour (min)	<Number>
Select work schedule	Mon-Fri 8-16 Mon-Fri 9-17 Other
Your expectations from ride sharing	I'm not interested in sharing rides Easier travel Cost savings or benefits Helping or meeting people Helping the environment Good reputation Other
Suitable ride compensation	Half of gas costs All gas costs for the ride Half of km allowance All km allowance for the ride Take turns in driver role Ride should be free volunteering

Table 22 – PiggyBaggy registration questions and answer options

Why did you offer or request this ride?	I could travel easier I could save costs I could help or meet people I could help the environment I could be appreciated by others
To drivers: How many minutes more did your trip last due to this shared ride?	<Number>
To passengers: How many minutes did you save in travel time thanks to this shared ride?	<Number>
If not recommending the shared ride to others: Why not?	It required too much effort Compensation for the ride is difficult I didn't like the other person's behavior Can't trust that ride always happens as planned Some other reason

Table 23 – PiggyBaggy feedback questions and answer options