

# The role of life events and context in type of car share uptake: Comparing users of peer-to-peer and cooperative programs in Oslo, Norway

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## ABSTRACT

This paper builds on a survey of existing users of two car sharing schemes in Oslo, namely Nabobil (peer-to-peer scheme P2P) and Bilkollektivet (cooperative scheme *Coop*), to understand how the following factors lead to active (or passive) car sharing – i. key life-events; ii. adoption/retention challenges; iii. acceptability; and iv. infrastructural needs. The conceptual framework of this study is informed by mobility biographies and social practice theory. A web-based questionnaire was distributed by the two service providers to their members, and approximately 1,724 users of P2P and 1,117 users of *Coop* participated in the survey. The survey collected information on travel behaviour, preferences, life-stages, mobility biography of the household, and life-events possibly leading to car sharing. Results highlight that using P2P scheme emerged as statistically significant for students moving to Oslo and for employees starting in new jobs. For the *Coop* members, the birth of first or later children were statistically significant events in households' decision to start with car sharing. Along with differences in meanings, skills, materiality and practices of car-sharing, users of the two schemes varied with respect to spatial details as well – proximity to transit-stops, access to high-frequency public transport services, walking/cycling infrastructure and, parking facilities. Further, for carsharing to become popular, ample institutional trust, capable of offsetting any lack of trust that users may have, needs to be built.

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## 1. Introduction

Car sharing has emerged as one of the primary innovative solutions to facilitate an eventual shift towards reduced car usage.<sup>1</sup> “The principle of car sharing is simple: individuals gain the benefits of private cars without the costs and responsibilities of ownership” (Shaheen et al., 2009: 35). It would be unreasonable to suggest that car sharing provides the users with exactly the same benefits of private car ownership; if that were the case, car sharing would already be a mainstream practice. It is, however, becoming apparent that car sharing is a more convenient and affordable option for some users. This paper explores two such (sub)groups of users in Oslo, Norway.

While various jurisdictions have their own criteria for car sharing, Millard-Ball et al. (2005: 2-2) recommend the following, used by the State of Washington, as the most concise and comprehensive definition:

“A membership program intended to offer an alternative to car ownership under which persons or entities that become members are permitted to use vehicles from a fleet on an hourly basis.”

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<sup>1</sup> The first formal car sharing organization in the world was Safage (Selbstfahrgemeinschaft), a Swiss program, established in 1948 and consisting of about one dozen members living in a housing cooperative. In the following decades, similar other attempts were made in France (Procotip, 1971), the Netherlands (Witkar, 1973), Great Britain (Green Cars, 1977) and Sweden (Bilpoolen, 1976 and Vivalla bil, 1983) (Shaheen and Cohen, 2007) – most of these efforts failed owing to technical and operational challenges (Harms and Truffer, 1998, p. 40). By the 1980s and 1990s, the first generation of viable car sharing organizations emerged in Switzerland and Germany (Shaheen et al., 1998), which remain two of the most developed car sharing markets in the world.

The literature on car sharing has grown in recent years, however, the field of market analysis has received the most attention (Degirmenci and Breitner, 2014). This paper expands the research focus by building on the theoretical framework of mobility biographies, combining it with a conceptual framework informed by social practice theory.

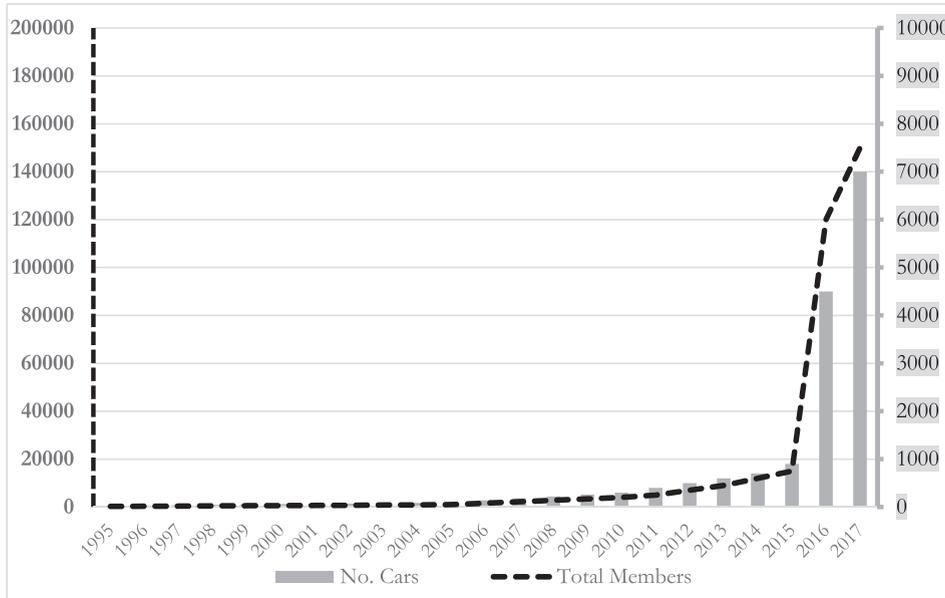


Fig. 1. Total number of registered members and vehicles in Norwegian car sharing organisations. (The dotted line corresponds to the dotted axis on the left, representing the total number of registered members. The bars and the solid grey axis to the right correspond to the total number of shared vehicles. These numbers are for the entire country.) Source: compiled through website, document analyses, and interviews with carsharing organisations.

Further, this paper studies a geographic context that has received less attention than other car sharing markets. Much of the literature of car sharing has focused on the North American and European contexts that have experimented with car sharing for several decades. Car sharing in Norway, and Oslo in particular, is an emerging mobility practice that has expanded dramatically in recent years, both in terms of usage and availability of platforms. There are currently nine established car sharing platforms in Norway that collectively offer over 7,000 shared cars to approximately 200,000 registered members (see Fig. 1).

Car sharing in Norway emerged in the mid-1990s and was largely inspired by similar endeavors in Switzerland and Germany that preceded the Norwegian counterparts by at least a decade. Since then, the sector has grown to include nine service providers that represent a broad range of business models and growth strategies. The earliest car sharing platforms in Norway were based on a member-owned cooperative business model. Driven by innovations in information and communication technology (ICT) and corporate investment, peer-to-peer (P2P) car sharing has emerged as an alternative model that may challenge the cooperative model for early users. The vast majority of these organizations focus on the Oslo metropolitan area, making it home to the lion’s share of car sharing activity in the country.

We expand on the case of Oslo in this paper to derive a picture of how key life events have impacted the uptake of car sharing in the city. Key events are of particular interest here, because changes in one’s environment and surrounding context can weaken routines, and a ‘window of opportunity’ opens up for change in everyday mobilities (Greene and Rau, 2016). This study provides knowledge on such ‘windows of opportunity’ to assist policy-makers in identifying timely interventions to both promote car sharing and retain users. The following will be addressed to analyse the relationship between car sharing and life-events (i) adaptation of long-term mobility decisions and car sharing, (ii) exogenous interventions, (iii) other preferences not directly related to mobility decisions, and (iv) socialization of mobility decisions. Further, the intersection of life-events and adoption/retention of car sharing will be analyzed from the perspectives of policy framing and implementation, and research gaps and needs.

Given that the study is a comparison of P2P vs. *Coop* users, it does not explain car share uptake itself (since it doesn't look at non-users), but rather compares two types of users. The focus is on users who are, by definition, early adopters and thus not representative of potential mainstream buyers.

## 2. Theoretical underpinnings

Research studies on car sharing have primarily focused on its historical development, market structure and the providers of carsharing (Shaheen and Cohen, 2008, 2013; Frost and Sullivan, 2012a, 2012b, 2012c; Degirmenci and Breitner, 2014; Spears, 2008; William, 2013). Sieving through an extensive literature review, covering 93 articles from 16 different journals and 8 conferences between 2004 and 2014, presented by Degirmenci and Breitner (2014), we found that the focus on car sharing users is quite limited,

and its linkages with the different life stages and altering practices is largely amiss.

And even though car sharing is increasingly being recognized as a 'sustainable' component of the transportation system, research is lagging behind on the following elements: (i) examination of long-term growth potential of car sharing with respect to the different demographic groups, (ii) possible impact on travel behaviour based on age and life stages, and (iii) industry-independent insight into the carsharing field. As the uptake of car sharing organisations (CSOs) is rising and competition between automakers and CSOs evolves, more fine-gained insights are needed from the perspectives of current and future users. Both design and marketing of targeted interventions for different user groups is largely amiss in the market. Projecting the future growth of carsharing necessitates that we contribute to the understanding of the relationships between social, economic, demographic, spatial, political and environmental dynamics that make the underlying principle of carsharing more applicable.

Concerning the design and viability of sharing platforms, [Andersson et al. \(2013:13\)](#) note that "platform design and adoption has been treated on an aggregated level, and to a far lesser degree on actual user experiences". This point is further supported by [Hawlitschek et al. \(2018:144\)](#) – "the success of peer-to-peer sharing platforms largely depends on the capability of platform providers to understand the users' motives for engagement".

In order to address these gaps, theories related to mobility biographies ([Sattlegger and Rau, 2016](#); [Schoenduwe et al., 2015](#); [Lanzendorf, 2010](#)) and social practice theory ([Kent and Dowling, 2013](#); [Shove et al., 2012](#)) have been used in this paper to develop a conceptual model to highlight if and how turning points in household members' life courses may trigger new sets of mobility practices. Life events like the birth of children, changes in the places of residence, education and employment, etc. may trigger the adoption of car sharing, but the factors playing a role in retaining and stabilizing car sharing as a social practice need further studying. We bring together the following two theoretical approaches to comment on the future of car sharing in Oslo: mobility biographies and social practice theory.

### 2.1. Mobility biographies

The primary theoretical underpinning guiding life course approaches or 'mobility biographies' research in travel behaviour studies is that travel demand changes over the life course of individuals. The mobility biographies approach focuses on how events and sudden disruptions act as turning points for individuals, that in turn can be important for mobility behavior. The concept posits that there are key events in different life course trajectories that can be detected through qualitative and/or quantitative methods ([Lanzendorf, 2010](#)). According to [Van der Wæarden et al. \(2003\)](#) such life events can be described as "major event[s] in a personal life that will trigger a process of reconsidering current behaviour". Life events that are subjectively important for individual life may be related to (i) age (marriage, childbirth, start of school, retirement), (ii) a historical period (war, technological change) and (iii) non-normative events (flood).

[Scheiner \(2007\)](#) further unpacks the concept by underlining its embeddedness into the context of other 'partial biographies', namely residential biography, employment biography, and household biography. The hypothesis is that although travel demand, at an individual, level might seem to be relatively stable in the medium term (as is typically analysed through National Travel Surveys), the demand changes significantly with key turning points in life. These turning points in life include important personal and familial events as well as changes in the places of residence, education and employment ([Beige and Axhausen, 2009](#)). And changes in both life events like birth of children and place of residence, education and employment directly impinge upon the spatial distribution of activities and associated activity space, thereby influencing the daily travel behavior. A longitudinal survey covering a 20-year period from 1985 to 2004 carried out in a stratified sample of municipalities in the Zurich region, Switzerland highlights that there exist strong interdependencies between the various turning points and long-term mobility decisions during the life course, as events occur to a great extent simultaneously ([Beige and Axhausen, 2009](#)).

Studying 'mobility biographies' entails studying the partial biographies of the tools, practices and context. This includes studying the ownership of mobility tools (such as cars and different public transport season tickets), the circumstances and factors that influenced people to start, stop or significantly change their mobility behaviour and patterns ([Schoenduwe et al., 2015](#); [Chatterjee and Scheiner, 2015](#)). Studies confirm the effect of life course and turning events on mobility decisions affecting the uptake of cycling ([Chatterjee et al., 2013](#)), car-ownership ([Clark et al., 2016](#)) etc. A disaggregated analysis can therefore assist in generating knowledge on the turning points in travel behaviour leading to an uptake of car sharing practices as triggered by contextual change, intrinsic motivations and facilitating conditions. [Müggenburg et al. \(2015\)](#) frames the policy implications for such studies by highlighting how knowledge on topics related to when and how mobility behaviour changes opens up a 'window of opportunity' to plan for and maintain (desired) behavioural changes.

[Rau and Manton \(2016\)](#) scaffold upon 'mobility biographies' to introduce the concept of 'mobility milestones', which they describe as mobility-related events across the life course that show a very high dependence on (infra)structural factors. This contribution engages with the centrality of interactions between structural factors and human agency, thus taking the discussion beyond individual, family or life-events induced changes in travel behaviour. [Sattlegger and Rau \(2016\)](#) further build on the coalition of human agency and structural factors by saying that plotting of this interplay can shed light on both opportunities and drawbacks for sustainability transitions in the transport sector.

### 2.2. Social practice theory

Social Practice Theory (SPT) is a departure from the more conventional academic approaches that explain human behavior through the mutually exclusive lenses of agency and structure. These conventional approaches characterize the human subject as being either *homo economicus* and *homo sociologicus* ([Reckwitz, 2002, pp. 245-246](#)). The former conceptualizes social order as being the combination of individual purposes, intentions and interests, whereas the latter relies more on collective norms and values. Although self-interested decision making and conformity to social norms are not completely abandoned in the SPT approach, they are

not sufficient grounds upon which to adequately explain human behavior. SPT brings together the conceptualizations of body, mind, things, knowledge, discourse, structure/process and agent to localize the social with the practice as the main unit of analysis (Reckwitz, 2002). Schatzki (2011) attempts to bridge the gap between these elements by using SPT to comment on the local or micro phenomena (e.g., Brand, 2010) and large social phenomena (Giddens and Bourdieu).

A practice can be described as a routinized type of behavior consisting of a set of interconnected elements; although there is no consensus concerning what these elements are, a common interpretation breaks it down according to materials, skills and meaning (Reckwitz, 2002; Pantzar and Shove, 2010). Practices do not emerge by creating new elements, but by forming new combinations of existing elements. It should be emphasized though that elements are not ontological categories that describe the world “as it really exists” but is a tool used to conceptualize social behavior.

SPT can also lend itself to discussions on both practical interests in the governance of sustainable social arrangements and delineating the character and possibilities of governance by highlighting what is governed as well as what needs to be (Pantzar and Shove, 2010). SPT brings to fore the need to examine the interplay between innovative products/services and their users/adopters.

Pantzar and Shove (2010) argue that innovation is not a one-off moment but a continuous on-going process that persists through the reproduction of practices. This reproduction, they argue, takes place through a collusion of managers, manufacturers and consumers who make and sustain connections between the defining elements of practices. Pantzar and Shove (2010) illustrate and elaborate on these ideas through the case of Nordic walking, a form of speed walking with two sticks. This case brings some pertinent questions to the fore, bearing special significance for the case of car sharing: “how can managers and manufacturers institutionalise practices that require consumption of the things they make? Is there any fundamental difference in the role of ‘lead’ and ‘ordinary’ users in generating and sustaining innovations in practice?” (Pantzar and Shove, 2010:441).

Pantzar and Shove, 2010 provide arguments that can be used to merge mobility biographies and SPT to analyse the case of car sharing. They bring together a focus on providers & actors through posing the question “How do the careers of practices and those who “carry” them actually intersect?” By focusing on the constituent elements of materiality, skills and meanings, SPT provides a framework for analyzing how practices emerge, how they persist and how they are abandoned. As Pantzar and Shove (2010) point out, the integration of the element of practices are a collective achievement that involves active participation of product/service providers as well as their users and adopters. Merging SPT with mobility biographies allows the researcher to combine in-depth analyses of day-to-day behavior offered by the former with broader perspectives of practitioners themselves offered by the latter.

The essential take away is rather than treating ‘human need’ or ‘societal functions’ as static and given, we need to consider how various sustainable practices come into existence, how they disappear and how interventions of different forms may be implicated in these dynamics (Shove and Walker, 2010:471). Fusing Mobility Biographies and SPT helps us think beyond utilitarian incentives and norm conformity, and can provide insights for understanding the challenges involved in transitioning to a new practice at different life stages, and of governing these transitions to plan for sustainable daily travel behaviour. Similarly, Watson (2012) explores the potential of fusing practice theory approach with socio-technical systems approaches to illuminate the systemic changes required in the field of transport.

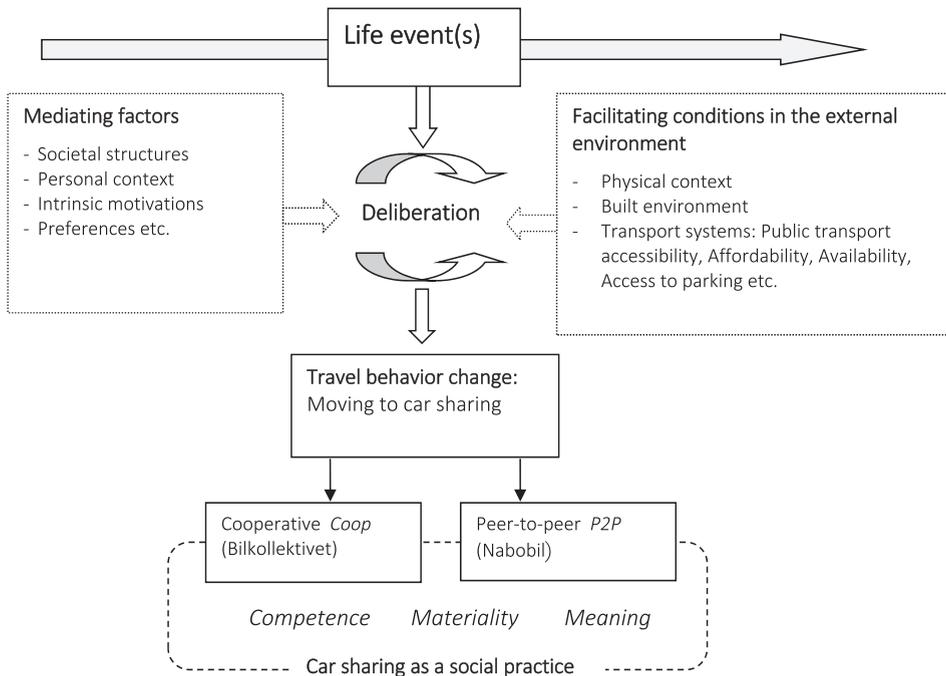


Fig. 2. Conceptual model (based on Clark et al., 2016 and Chatterjee and Scheiner, 2015).

**Table 1**  
The analytical framework.

Constitutive elements ( <i>drawn from the Social Practice Theory</i> )	Elements of Mobility Biographies
<b>Competence/skills:</b> bodily knowledge, competence or skill required to engage in the practice	Changes at the <b>practitioner level</b> triggered by life events and life stages.
<b>Materials:</b> ‘things’ or technological product	
<b>Meanings:</b> mental activities, symbolic meanings and image	

### 2.3. Synthesis: Life events, social practice and car sharing

The analyses in this paper is guided by Clark et al.’s (2016) earlier conceptualization of life events and travel behavior changes. According to the authors, life events trigger reflections and deliberations on current behavior and subsequent changes in behavior is contingent on personal history, intrinsic motivation and facilitating conditions in the environment. Building on the idea described above, we posit that a shift towards using shared cars (rather than owning and using private ones) can emerge out of life events, in combination with other factors during the deliberation process (Fig. 2). As illustrated in our extended conceptual model, the preference for a certain type of car sharing is optional and as the practice matures, elements of competence, materiality and meaning get further interlinked. Although some of these elements may be similar, we assume that they might differ in their content in the different car sharing formats. Table 1 outlines the analytical framework to bring together the two theories.

The assumptions that we investigate further are as following: (i) certain life events can trigger changes in travel behavior leading to selection of a particular type of car sharing scheme; (ii) different life events may spur an interest for car sharing, although they may vary for the two car sharing schemes; (iii) mediating factors as well as conditions in the external environment may be important for these outcomes, and; (iv) the uptake of P2P and cooperative scheme may develop into divergent car sharing practices.

## 3. Oslo: The case and context

### 3.1. The ‘desired’ transport trajectory in Norwegian urban regions

The Norwegian central government and regional/local authorities have, to varying extents, committed to reducing the carbon footprint of the transportation sector. These efforts are geared towards either making cars cleaner or eliminating the need for cars in the first place. Generous subsidies and other support mechanisms have made Norway a global leader in electric vehicles deployment and usage. At the same time, multi-modal and active transit are being promoted as alternatives to automobile dependency in general. The most recent National Transport Plan has put forth a “zero-growth objective” in which “the growth in passenger transport in cities is to be absorbed by public transport, cycling and walking” (Norwegian Ministry of Transport and Communications, 2017). Given that the population growth of Norwegian cities is expected to continue for decades, accommodating the increased transportation needs of Norway’s urban residents without additional automobiles will require radical approaches to transforming the transportation system. Though the NTP and related documents recognize the role of car sharing for achieving such scenarios, these policy documents remain silent about the users and their practices. It is simply assumed that proving infrastructure will bring about changes automatically.

### 3.2. Tracing the historical development of car sharing in Oslo

The first formal car sharing service provider in Norway, Bilkollektivet, was established in 1995 in the country’s capital and largest city, Oslo. The name Bilkollektivet literally translates to ‘the car collective’ and like many of its European successors, it was a member owned cooperative. In 1996, similar car sharing organizations were established in the second and third most populous cities in Norway – Bildeleringen in Bergen and Trondheim bilkollektivet. These service providers were also member owned cooperatives and represent a prime example of user-driven innovation in the field of urban mobility.

These three cooperatives represented the totality of Norway’s car sharing sector for nearly a decade. In 2004, a fourth service provider, Oslo bilpool, entered the Norwegian car sharing market. Oslo bilpool was created at the behest of a consortium of actors, most notably, the Norwegian real estate developers Selvaag Forvaltning and Avantor. The entry of private corporate interests marked an important shift in the Norwegian car sharing market, which until then had been dominated by member driven cooperatives. In 2010, Oslo bilpool was acquired by the international car rental company Hertz and was renamed Hertz bilpool. The company currently has a fleet of over 150 vehicles, most of which are located in the Oslo metropolitan area, but which are also available in many of the larger cities in the country.

A second for-profit car sharing service provider, Move About, was established in 2007 and began offering services in late 2008. The company, which is located mostly in and around the Oslo metropolitan area was the first service provider in Norway to offer a fleet of 100% battery electric vehicles.

In 2016 OBOS, the largest housing cooperative in Norway, partnered with the Avis/Budget Group, one of the largest car rental companies in the world, to offer a car sharing scheme exclusively to its members. After three years of piloting and limited operation, the partnership shifted. The service, which had been known as Avis Now, was taken over by Zipcar, a subsidiary within the Avis/Budget Group. Given that Zipcar is one of the largest car sharing organizations in the world, it can be assumed that it has ambitions to expand beyond the current fleet of eight vehicles.

In recent years several new car sharing providers have entered the market, offering car sharing as a peer-to-peer (P2P) service. Nabobil is the largest P2P car sharing provider in Oslo (and Norway) and is a mediating platform for bringing together private car owners who wants to rent out their cars to other private persons/households. Its value proposition is to provide cars to customers that need access to a car, and to offer car owners a possibility to rent out their private car in order to reduce the costs of owning and maintaining a private car. This is often labelled as ‘smart car ownership’. The car is booked online via smartphone app or web browser and the user pays for the time used, normally a fixed price per day. Insurance is included in the price but the customer must pay for additional costs such as fuel, toll fees, etc. Nabobil is a round-trip car sharing company and customer must return the car to the same place where it was picked. Nabobil was established in 2015 and has had a remarkable growth. The company currently has approximately 170000 registered members (Dec. 2018) and 5,500 cars located throughout Norway. Since its founding three years ago, there have been over 100,000 transactions carried out using the platform. This suggests that a significant number of registered members are not active users.

Another prominent entrant into the market is Hyre, which operates a hybrid model that combines elements of P2P and B2C (business to customer). It currently offers over 200 vehicles, mainly in Oslo, consisting of those owned by individuals as well as professional actors that are neither individual car owners nor formally part of the Hyre company. Unlike Nabobil *uten nøkkel* (without keys), which is an optional service for members, all vehicles in the Hyre fleet are available to members through mobile phone app. Furthermore, Hyre has partnered with BankID, Norway’s leading electronic identification authentication platform, to facilitate vehicle bookings, pickup, use and drop-off by mobile phone app.

From a spatial perspective, the car sharing stations are almost always located in central areas with a high residential or business density to sustain a viable customer base.

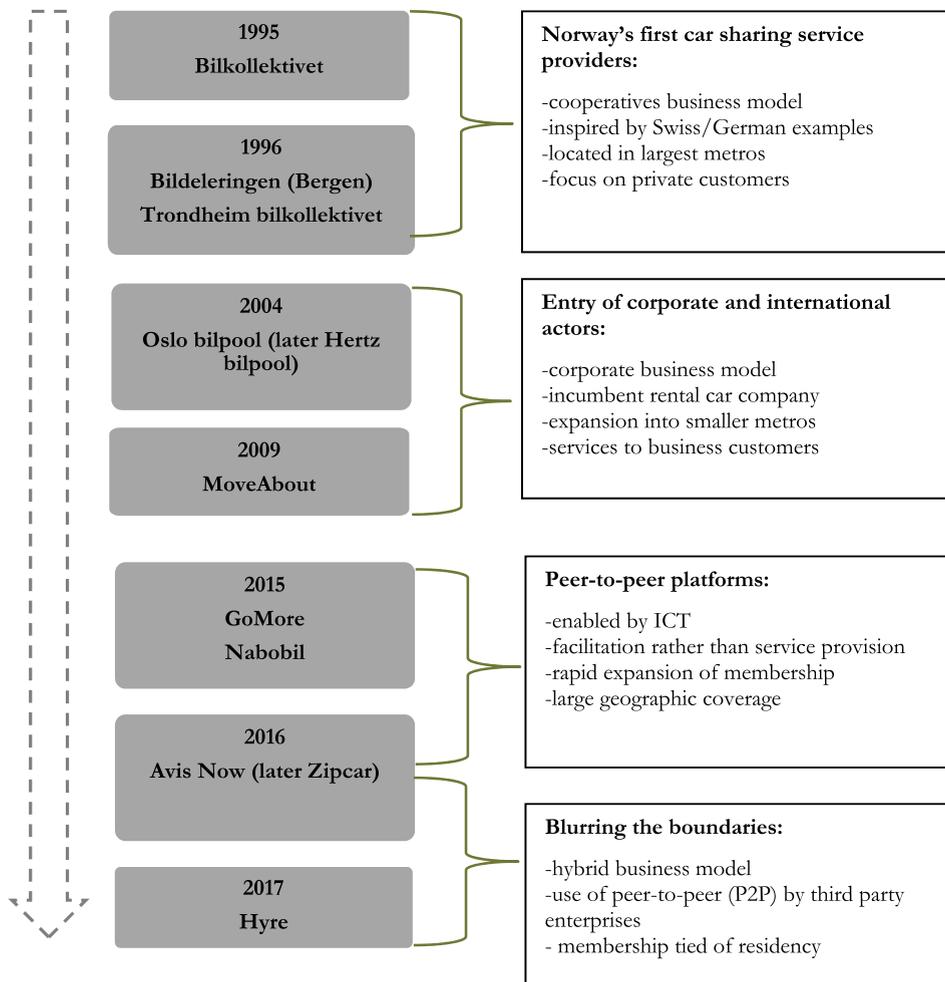


Fig. 3. The emergence of the Norwegian formal car sharing sector from 1995 to 2017.

Fig. 3 presents a snapshot of the emergence of the Norwegian formal car sharing sector from 1995 to 2017.

## 4. Methodology

### 4.1. Data collection and sample

Nabobil and Bilkollektivet are based on different business models, the suitability of which may vary for individuals and households in different life stages. Nabobil represents a peer-to-peer (P2P) model offering a mediating platform for private car-owners who want to rent out cars to other individuals/households. Bilkollektivet, on the other hand, operates as a cooperative, offering services to paid members only.

**Table 2**  
Coop vs. P2P.

	Bilkollektivet (Coop)	Nabobil (P2P)
Year established	1995	2015
Business model	Cooperative	P2P
Operational model	Station-based	Station-based*
Registered users	7,000	170,000
Number of cars	300	5,500

\* Although there is no fixed station with P2P carsharing, vehicles must be picked up and delivered as per the agreements made by the “peers”, most typically, near the residence of the provider peer.

Of all the car sharing options in Oslo, Bilkollektivet and Nabobil are the most prominent platforms that typify these two different approaches to car sharing. Bilkollektivet is well established and represents the ‘traditional’ form of car sharing, whereas Nabobil embodies the tech-driven startup that has grown rapidly in recent years. This study focuses on the differences between the users of these two platforms and the significance therein. Hereafter, we refer to Nabobil as *P2P* and Bilkollektivet as *Coop* (see Table 2).

A web-based questionnaire was distributed by the two service providers to their respective members.<sup>2</sup> The survey was distributed in November-December 2017. After cleaning the data and removing incomplete questionnaires, a total of 2,856 valid questionnaires from the users of *Coop* and *P2P* were registered. Approximately 1,724 users of *P2P* and 1,117 users of *Coop* participated in the survey. The survey collected information on travel behaviour, preferences, life circumstances, mobility biography of the household, and further probed life-events possibly leading to car sharing.

**Table 3**

Key categorical variables and car sharing type. Percent.

	P2P		Coop	
	N	%	N	%
<i>Gender</i> ***				
Female	539	31,0	460	41,1
Male	1198	69,0	659	58,9
<i>Education</i> ***				
Primary & lower sec.	31	1,8	7	0,6
Upper secondary	296	17,0	83	7,4
University (1–3 years)	600	34,5	280	25,0
University (> 3 years)	810	46,6	749	66,9
<i>Age</i> ***				
< 30	377	21,7	106	9,5
30–50	943	54,3	766	68,5
> 50	417	24,0	247	22,1
<i>PT distance</i> ***				
Under 500 m	1190	68,5	824	73,6
between 500 and 1000 m	390	22,5	209	18,7
> 1000 m	157	9,0	31	2,8
<i>Car owner history</i> ***				
Don't have, but previous owner	451	30,9	524	49,2
Car in household	782	53,6	175	16,4
Don't have and never owned	227	15,5	365	34,3

\*\*\* p < 0.001.

<sup>2</sup> The survey was also distributed to other car sharing companies, but for the purpose of the analysis presented here, we have excluded the users of the other companies.

**Table 4**  
Key continuous variables and car sharing type. Mean.

	P2P			CooP		
	Mean	Min	Max	Mean	Min	Max
<i>Life events</i>						
LE 1-Children <sup>***</sup>	-0,090	-1,566	8,105	0,139	-1,406	7,879
LE2-Relocate <sup>***</sup>	0,046	-1,566	8,105	-0,071	-1,859	4,348
LE3-Leisure <sup>**</sup>	0,068	-2,533	6,281	-0,105	-2,476	6,005
<i>Motives</i>						
Inclusive <sup>***</sup>	1,7	1	7	2,7	1	7
Practicality <sup>***</sup>	4,6	1	7	5,7	1	7
Environmental <sup>***</sup>	4,0	1	7	5,1	1	7
Cost saving	5,8	1	7	5,7	1	7
Car sharing identity <sup>*</sup>	4,3	1	7	5,3	1	7
Car identity <sup>***</sup>	4,0	1	7	2,5	1	7
<i>Parking</i>						
Parking access <sup>***</sup>	5,5	1	7	4,1	1	7

\*\*\*Sig < 0,001.

Tables 3 and 4 present a summary of the average, minimum, maximum and mean values of variables used in this study for each system. The data highlights that uptake or membership remains gendered as male users/members dominate both schemes, but significant differences related to age exist as well – P2P has a larger share of younger drivers.

#### 4.2. Variables

Various key variables were used in the analyses, including life events, social practices, motives, car history and access to transport infrastructure. A brief description of these variables is provided below.

**Table 5**  
Variables: Life events distribution. Occurred during last five years. Percent.

Life events experience (last 5 years)	P2P		Coop		All	
	Percent	N	Percent	N	Percent	N
Began studying	15,5	269	8,6	96	12,8	365
Relocated to my current residence	52,9	919	49,8	557	51,7	1476
Changed jobs	49,9	866	40,3	451	46,1	1317
Moved in with partner or roommate(s)	22,6	392	19,8	222	21,5	614
Birth of my/our first child	10,7	185	18,9	212	13,9	397
Birth of my/our child (not first)	8,9	155	12,0	134	10,1	289
Child in household began day care, kindergarten or school	18,5	321	24,2	271	20,7	592
Moved out from a residence with partner or roommates	10,1	176	6,5	73	8,7	249
I or someone in my household began a leisure activity that requires transport	19,6	341	12,4	139	16,8	480
Other important life events	7,3	126	7,5	84	7,4	210
No answer	15,9	277	19,7	220	17,4	497
Total		4027		2459		6486

*Life events:* Different techniques have been applied to capture life events – for survey designs, the most common approach is to use a prefigured list of events and ask respondents to indicate events retrospectively (Chatterjee and Scheiner, 2015). There is no standardized list of events, but there exists an agreement on the most significant ones, such as relocations, change in household composition and job shifts. In this study, we use a retrospective survey approach where the following nine life events were included: beginning to study; relocation; change of jobs; moving in with partners/roommates; child births (first and later); child starting at nursery, school; household member starting with a leisure activity. We asked whether they had experienced any of these events during the last five years, and (if so) to indicate the importance of these events for becoming a member of the car sharing scheme. The importance was rated on a 5-point Likert scale. Finally, we also asked the respondents to estimate how long it had been since a particular event had occurred. This approach relies on the autobiographical memory of the participants, as well as how influential these events had been for their subsequent choices (see Table 5).

*Social practice:* To guide the current study, we have relied on social practice approaches, especially the elementary approach, proposed by Elisabeth Shove and her colleagues (Shove et al., 2012). Following this line of thought, social practices can be analyzed as interconnected elements involving materiality, meaning and competences. In the survey, these three dimensions of car sharing as a social practice were explored through a set of questions about the emerging use of the two platforms in Oslo. It should be stressed that

this analysis does not capture every aspect of car sharing as a practice, nor does it give a full representation of the elements that are involved. Nonetheless, they provide empirical evidence of how car sharing, as a P2P or a *Coop* scheme, is emerging as a set of ‘proto practices’ (Shove et al., 2012).

*Motives for car sharing:* There is a distinction between instrumental, normative, affective and symbolic dimensions (Jensen, 1999; Noppers et al., 2015; Steg, 2005) in their influence on both starting and continuing with car sharing usage. To capture these dimensions, we have applied a minimal set of questions. For the instrumental dimension, we asked them to indicate agreement with the following statements: ‘I can save money with car sharing’ and ‘car sharing is more practical than owning a car’. For symbolic motives, we asked the respondents to indicate agreement with the following statements: ‘Car sharing fits with my identity’ and ‘I identify as a motorist’. To capture more normative types of motives we asked them to indicate agreement to following statements: ‘I wish to travel in environmentally friendly ways’ and ‘car sharing is more social and inclusive’.

*Car ownership history:* Respondents’ history as car owners may play an important role in influencing their choices in opting for car sharing. We asked whether they or someone in their household previously owned a private car and/or if they had one in the household.

**Table 6**  
Social practice variables.

Materiality
<ol style="list-style-type: none"> <li>1. <u>Trips purposes</u> for which the shared car is usually hired – work-related travel, escorting, grocery shopping, bulky purchases, leisure travel, vacation/weekend trips</li> <li>2. <u>Material elements</u> that the users highlighted to promote and retain their use of car sharing – dedicated parking spaces, right to drive in bus lanes, increased access to shared vehicles, availability of newer and better cars, simpler handling of equipment</li> <li>3. <u>Distance to the nearest public transit stop</u> that one normally uses or would potentially use</li> </ol>
Meaning
<ol style="list-style-type: none"> <li>1. Meanings attached to car sharing: <u>social, environmentally-friendly, identity, unsafe</u></li> <li>2. <u>Opportunities</u> offered in the city</li> <li>3. Views on <u>climate and environment</u></li> <li>4. Identification as a <u>motorist</u></li> <li>5. Meanings associated with <u>urban life</u></li> <li>6. <u>Environmental concerns</u></li> <li>7. <u>Trust</u></li> </ol>
Skills/habit formation
<ol style="list-style-type: none"> <li>1. <u>Habit formation</u> – regarding the daily use of different transport modes</li> <li>2. Changes in <u>travel habits</u></li> <li>3. <u>Awareness</u> of expenses involved</li> </ol>
Meaning + Skills
<ol style="list-style-type: none"> <li>1. Feeling <u>secure</u> using the <u>booking system</u></li> <li>2. Feeling <u>secure</u> when <u>picking up and returning</u> the vehicle</li> <li>3. <u>Preference</u> for new technologies</li> </ol>

*Material and social infrastructure:* To capture the material dimension, possibly influencing the choice of car sharing, we asked the following questions: ‘How good is access to parking where you live?’ and ‘Approximately what is the distance to the closest public transport stop?’ The scale was: under 500 m; 500 to 1,000 m; and more than 1,000 m. Table 6 highlights the set of practice variables that have been clubbed together under the categories of materiality, meaning and skills, and further analyzed to plot the differences between these social practice elements of the users of the two car sharing schemes studied in this paper.

## 5. Results

### 5.1. Descriptive data analyses

In this section, we focus on the users of these two schemes and plot the adoption and retention challenges associated with these groups. In order to steer this discussion to comment on the practices of these two groups, we look at the issues related to materiality, skills and meaning as constituent elements of practice.

The questions which have been further analysed under these broad headings are outlined in Table 6.

The material connection and issues associated with car sharing usage need to be better understood in order to facilitate targeted design and marketing interventions. We have looked at the broad elements of materiality that are significantly different between the users of P2P and *Coop* in order to present a general picture of the variations between these two groups.

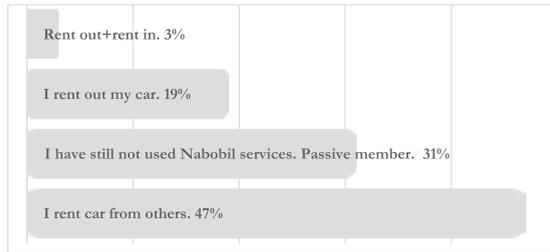


Fig. 4. Question posed to P2P members – How do you use your P2P membership?

While most of the respondents who are members of the *Coop* actively use the service to rent cars, the same is not true for the respondents of the P2P cluster. As Fig. 4 highlights, while 31 percent of the P2P members aren't actively using the car sharing scheme, 19 percent are using the scheme to rent out their car, effectively pushing the members not actively using car sharing to 50%. This is corroborated by the facts quoted on the website of Nabobil (<https://nabobil.no/>) stating a membership of 170,000, but only 100,000 transactions in the past three years.

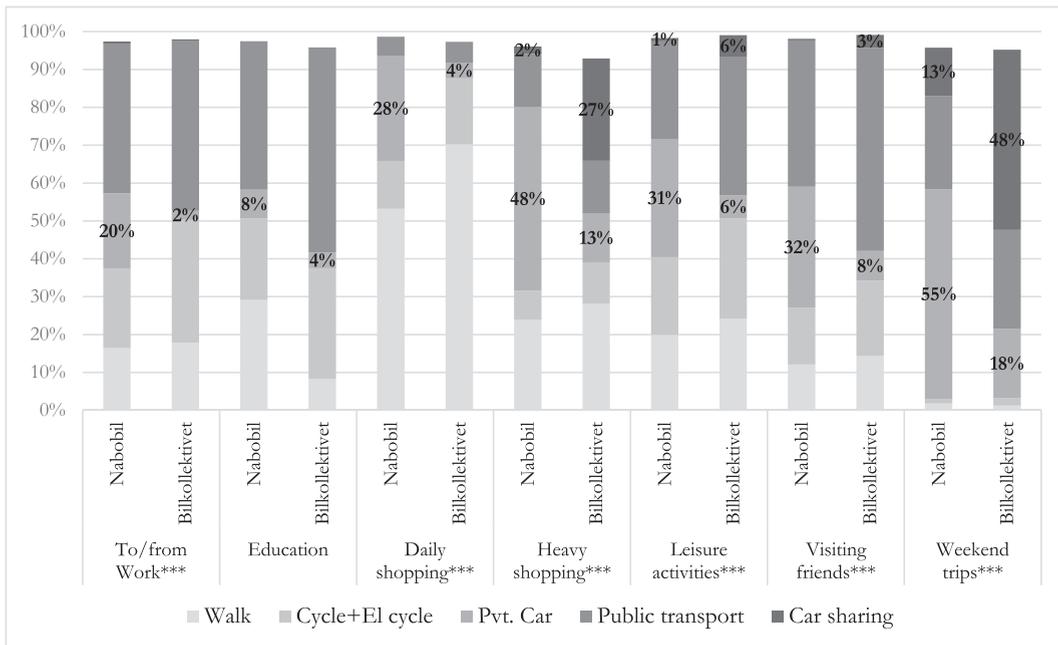


Fig. 5. The usual and normalized routine of using different modes for different trip purposes by the two user groups. \*\*\* mean scores are significantly different for the two groups,  $p < 0.001$ .

The dominance of private car usage among the P2P members is evident in the following figure, where private car vs. shared car usage remain markedly (and significantly) different among the two user groups (see Fig. 5).

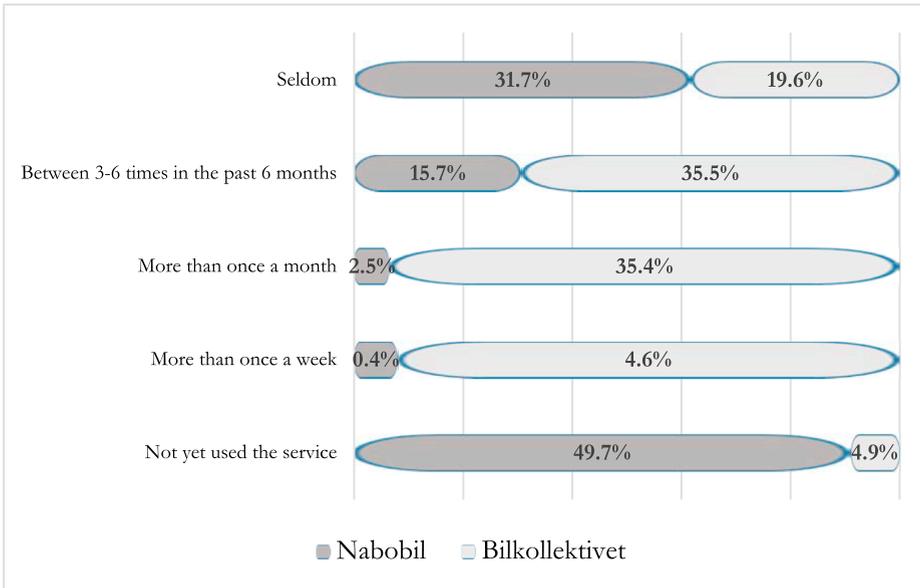


Fig. 6. Frequency of usage of car sharing scheme in the past six months. Percent.

A further probing into the data reveals that 70 percent of the *Coop* members availed the car sharing services at least once a month while 80 percent of the P2P members are merely registered in the system rather than actively using the scheme Fig. 6. The differences between the groups is statistically significant at 95% confidence interval (Pearson chi-square = 1114.20, df = 4,  $p < 0.001$ ).

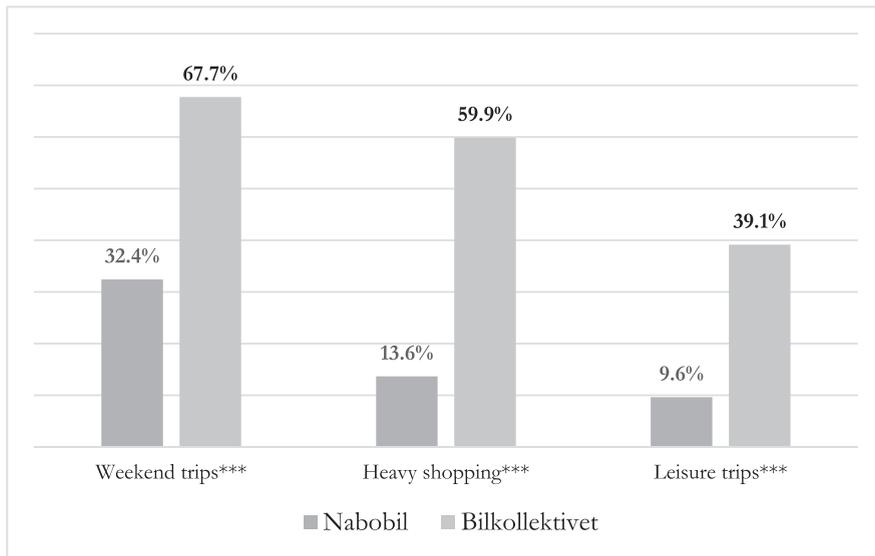


Fig. 7. The primary trip purposes segregated by the two schemes. \*\*\* mean scores are significantly different for the two groups,  $p < 0.001$ .

The respondents were asked to mark three primary trip purposes that formed a major share of their usage of the respective car sharing scheme. While the hierarchy of trip purposes was same for the groups – weekend trips, heavy shopping, and leisure trips – the share of the respondents is significantly different for these two user groups (see Fig. 7).

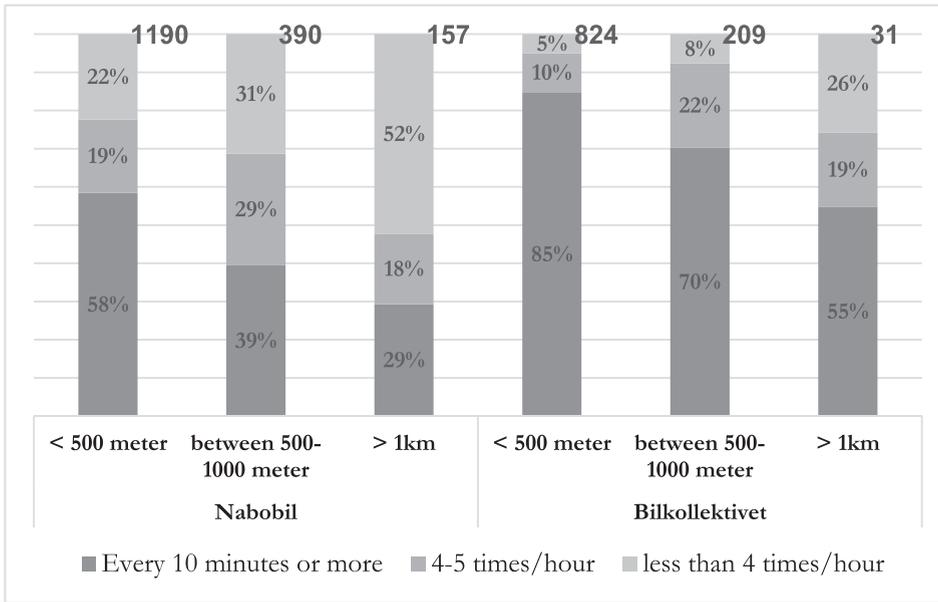


Fig. 8. Cross-tabulation between public transport frequency and distance to public transit stops.

One of the reasons for this varied usage could be access to public transport services, and in order to further explore this aspect, respondents were asked to plot the distance to the nearest transit stops most frequently used by them and the corresponding frequency of the public transport service on these stops. Of the 1,724 P2P respondents who answered both of these questions, 1,190 had the transit stop less than 500 m, and 58 percent of these indicated a frequency of every 10 min or more frequent. The corresponding figures are much higher for the *Coop* members, representing a general pattern of spatial concentration in areas with good public transport options (see Fig. 8).

The spatial dynamics of car sharing practice also plays out prominently through availability of parking facilities. As George (2018) contends “...parking and maintenance are examples of practices that are so ‘tightly integrated’ with the practice of driving that they form a complex of practices. In this analysis, they can be considered ‘sub-practices’ of the more general practice of private vehicle use – the former is absolutely necessary in order for the latter to be practiced”. It seems that the stress related to parking might also be an

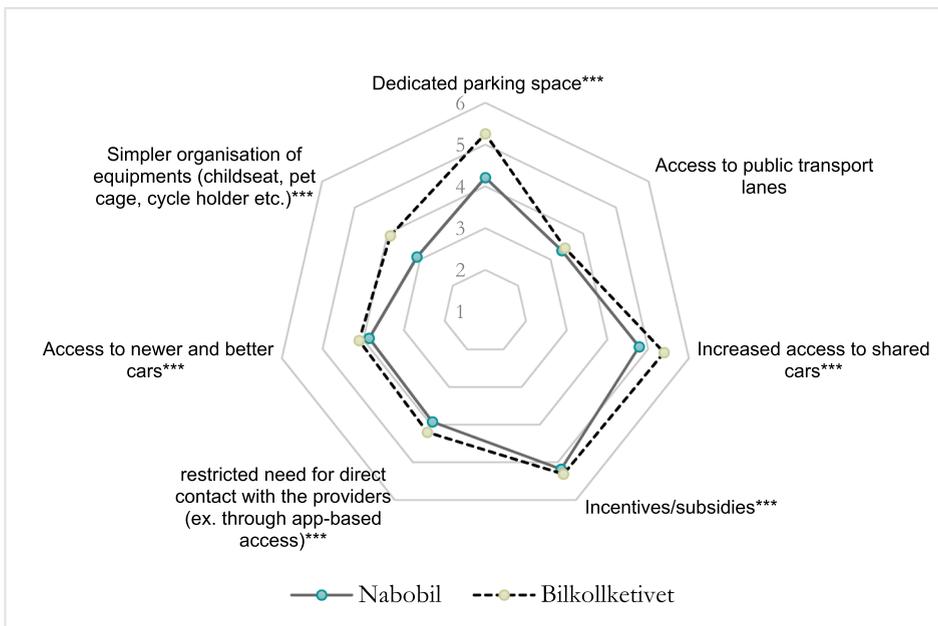


Fig. 9. Factors which might lead to an increased use of car sharing schemes. Scored on a scale of 1–7, 1 = to a lower extent, 7 = to a greater extent. \*\*\* mean scores are significantly different for the two groups,  $p < 0.001$ .

important factor pushing people to use car sharing, as highlighted by the differences in mean scores between the two groups. When posed with the question “how would you rate access to parking in the vicinity of your residence?” (score ranging from 1 to 7, where 1 = very poor, 7 = very good) *Coop* members had a score of 4.14, whereas P2P members had a score of 5.46 indicating a much better access to parking ( $p < 0.001$ ). One can hypothesize that parking difficulty discourages car use, and with reserved spaces, car sharing eliminates this difficulty and encourages further use of car sharing.

In order to plot the factors that might lead to an increased use of car sharing, the respondents were asked to mark the different factors on a scale of 1–7, where 1 highlights change will occur to a lesser degree and 7 being the opposite end of the spectrum. As Fig. 9 shows, provision of dedicated parking space was given the highest mean score by both the groups. Though the mean scores by the P2P members are lower and statistically different from the mean scores of the *Coop* members, a certain pattern can be discerned which supports the following:

- Dedicated parking spaces which eases access to shared cars: in a series of interview done with households using car sharing schemes, this point was further confirmed. Respondents emphasized the need to cut out the phase of picking and delivering cars at dedicated areas, and rather have dedicated parking spots available in close vicinity.
- Incentives and subsidies to reduces the costs of car sharing: apart from directly addressing the transport sector, Norway, being a welfare economy, has multiple incentives and subsidies sewn in the structure of its taxation system that can lead to increased usage of car sharing schemes. The success of electric cars in Norway is also, to a great extent, based on a generous set of incentives and subsidies.
- Organisation of equipment like child seat received a 1-point higher mean score by the *Coop* members compared to the P2P members, outlining the differential effects of life stages on these two groups. Interviews conducted with households with young children further confirmed that the biggest barrier that these families face in using car sharing in the setting up and dismantling of child seats (George, 2018).

The role of cars and its impacts on car sharing is another important factor to study to comment on if and how a substantial shift away from car can be planned. While the members of P2P have a clear fascination with cars as a product, and they further identify themselves with cars, the same is not true for the *Coop* members. What we see here is the emergence of two very different groups which is fundamentally divided in its usage and preference for car sharing. The mean scores for most of the factors are significantly different for the two groups at a 95% CI.

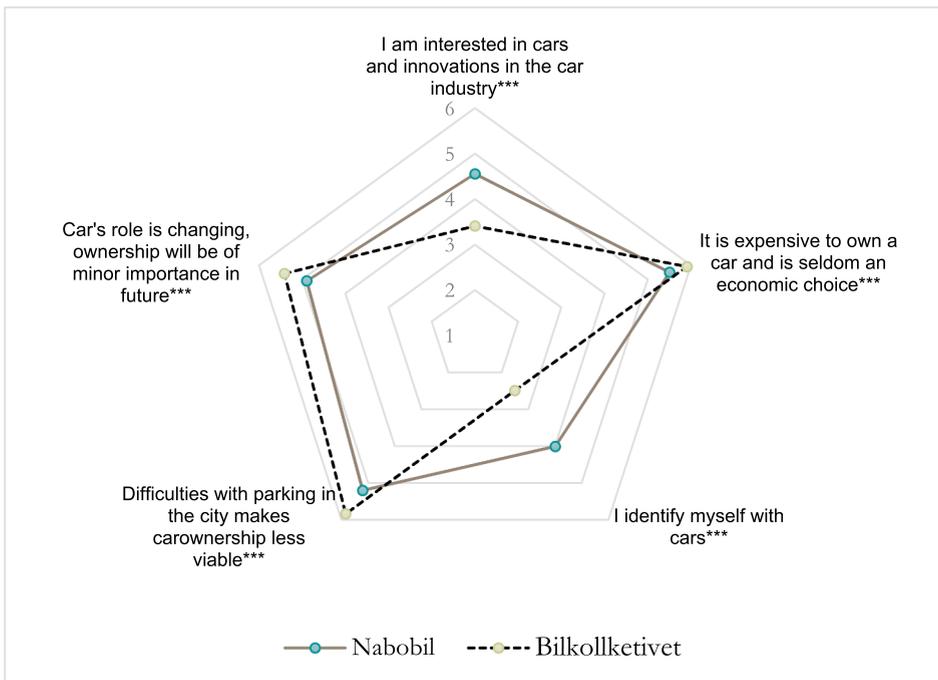


Fig. 10. Role of car and its impacts on car sharing. Scored on a scale of 1–7, 1 = completely disagree, 7 = completely agree. \*\*\* mean scores are significantly different for the two groups,  $p < 0.001$ .

One of the reasons why car sharing is not being used, despite being enrolled as members in the P2P scheme, is that this group has signed up to either try out new models like Tesla which they don't have access to in their daily lives or have an option available to them to eliminate the need of purchasing a second car. Respondents using *Coop*, on the other hand, use other transport modes to fulfill the needs of their daily trips and employ the option of car sharing to cover the trips which strictly require a car (see Fig. 10).

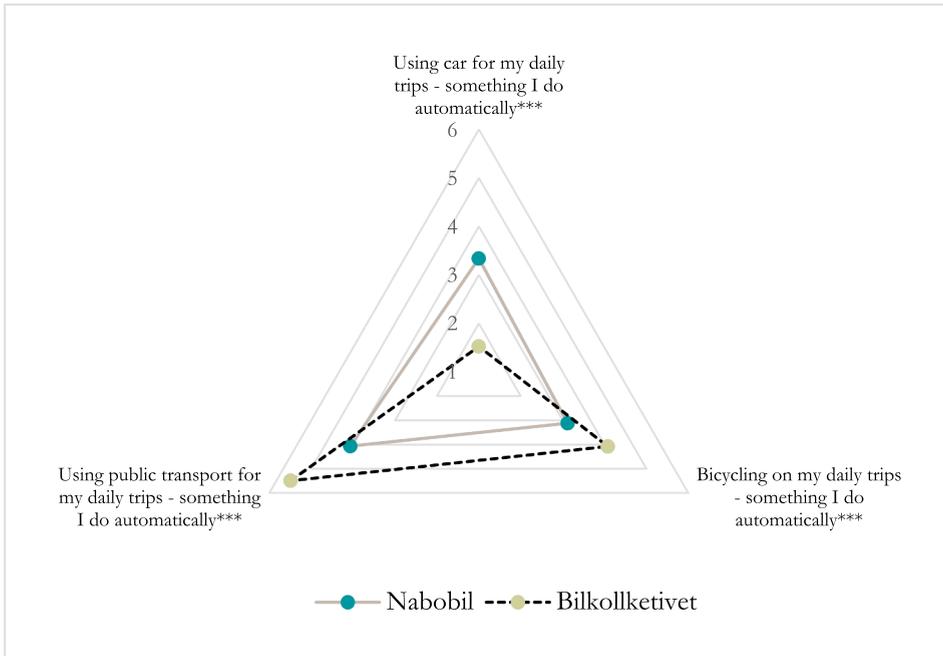


Fig. 11. Daily mobility and mode selection. Scored on a scale of 1–7, 1 = completely disagree, 7 = completely agree. \*\*\* mean scores are significantly different for the two groups,  $p < 0.001$ .

This hypothesis is confirmed through exploring the mean scores given by the respondents on their usage of the different transport modes. While the *Coop* members use public transport and bicycle for their daily trips, quoting it as an embedded decision, P2P members display a stronger tendency to use cars for their daily trips. By invoking the word *automatic*, we want to highlight that automatic usage is predicated on a skill set that enables the practitioner to carry out the practice. Without the necessary skills, the practitioner will not be able carry out the activity, let alone do it in such a manner that it become habituated or automatic. Thus, in order to shift the majority towards using car sharing, the underlying travel behaviour of using public transport and bicycling needs to become automatic (see Fig. 11).

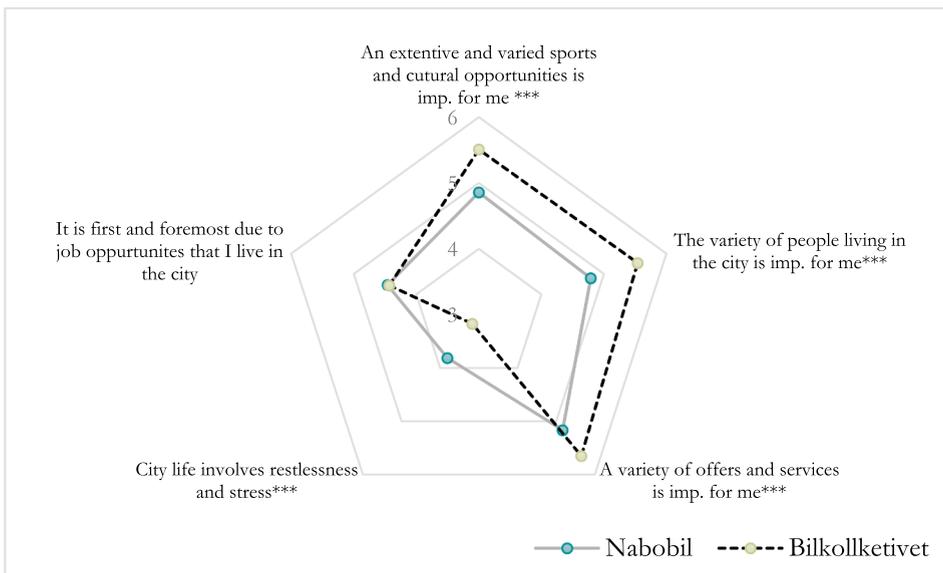


Fig. 12. Meanings attached to living in a relatively dense urban area. Scored on a scale of 1–7, 1 = completely disagree, 7 = completely agree. \*\*\* mean scores are significantly different for the two groups,  $p < 0.001$ .

The embeddedness of these automatic responses is an integral part of their spatial location, which offers the right modal choices and, thus, the consequent automatization of choices. We were also interested in plotting if there are differences between how locational decisions varies between the two groups. As Fig. 12 highlights, P2P users associate city life with stress and restlessness, apparently indicating their location as being more suburban in nature. A clear preference for variety of services, culture and sports facilities is displayed by the *Coop* users, marking yet another difference between them and the P2P users.

We were further interested in unearthing the intrinsic preferences of these two groups. What emerges is quite an interesting and, to a certain extent, shocking pattern.

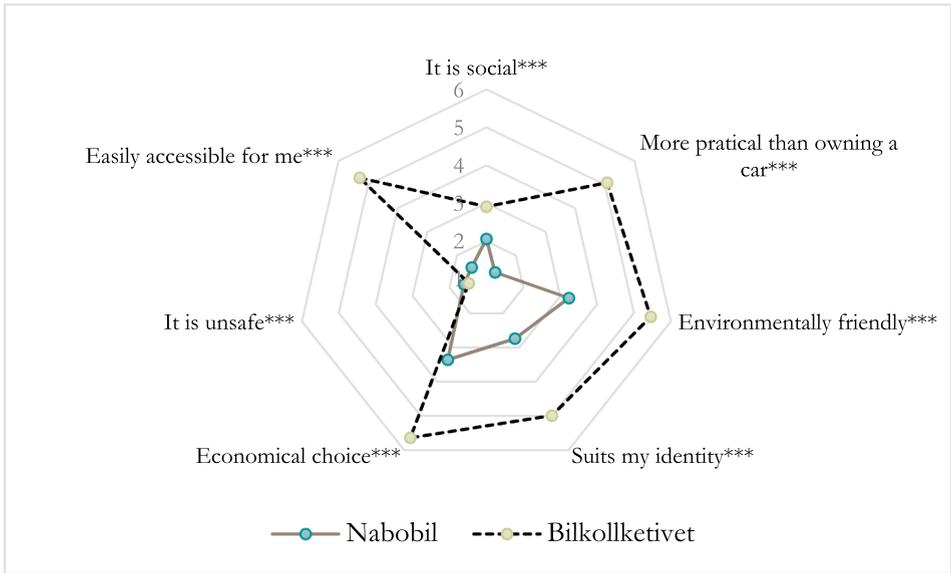


Fig. 13. Meanings attached with car sharing. Scored on a scale of 1–7, 1 = completely disagree, 7 = completely agree. \*\*\* mean scores are significantly different for the two groups,  $p < 0.001$ .

The *Coop* members have opted for car sharing as a conscious choice and regard it as an optimized solution from several perspectives – practical, economic, environmental and as a marker of identity closely linked to the emergence of new forms of urbanism (see Fig. 13).

It is, at the same time, shocking to plot the low level of trust for different groups as exhibited by the mean scores of the P2P members. Though this question did not deal with car sharing *per se*, it has strong effects on the meanings associated with habitual practices, of which car sharing is envisaged to eventually become one.

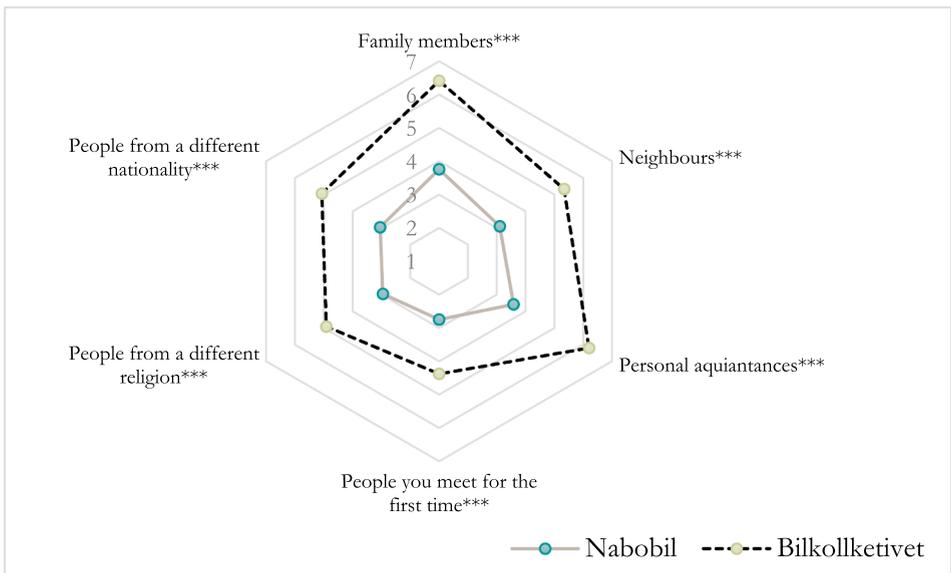


Fig. 14. Level of trust recorded by the respondents for different groups. Scored on a scale of 1–7, 1 = no trust, 7 = to a high degree. \*\*\* mean scores are significantly different for the two groups,  $p < 0.001$ .

It seems that one of the reasons why P2P hasn't taken off in Oslo is simply because members exhibit a low level of trust in general. This issue might be getting further compounded when one must deal one-to-one with another person in exchanging a material property – the car. Even though they are registered in the P2P scheme, a user may be skeptical of actively using the scheme. If that is the case, then the most feasible option seems to plan car sharing through an organized company that maintains a fleet of vehicles, where trust issues are dealt with in a different manner. Norway has a long history of cooperatives, and this model could be further explored to bolster the usage of car sharing in the Norwegian urban areas (see Fig. 14).

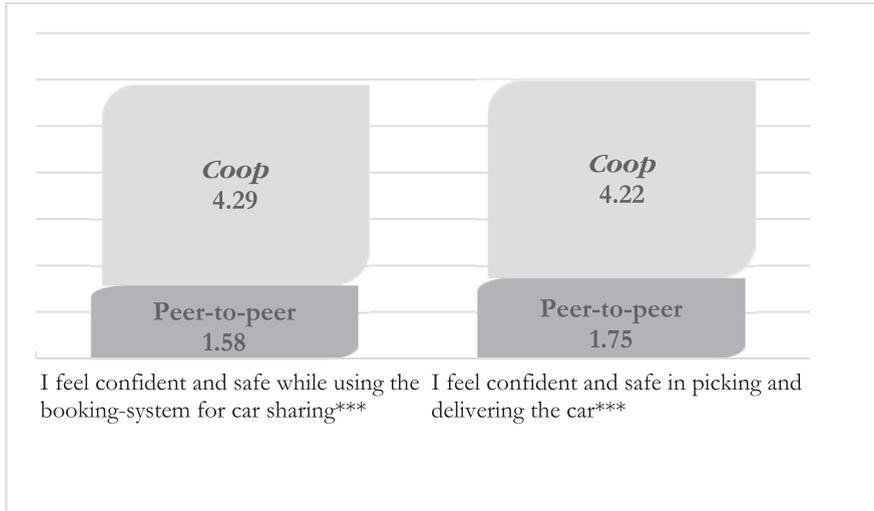


Fig. 15. Mean scores on the interface of using car sharing system. Scored on a scale of 1–7, 1 = completely disagree, 5 = completely agree. \*\*\* mean scores are significantly different for the two groups,  $p < 0.001$ .

The ease of using an organizational interface, however, needs to be further refined in light of the findings presented in Fig. 15. Coop members are consistently high on their mean scores for using and preferring car sharing, and their mean scores on feeling confident and safe using the system also remains higher than the P2P members. One reason could be that P2P members have exhibited issues with trusting others, and they carry forward this mistrust to the system as well. This point, however, is worth exploring further.

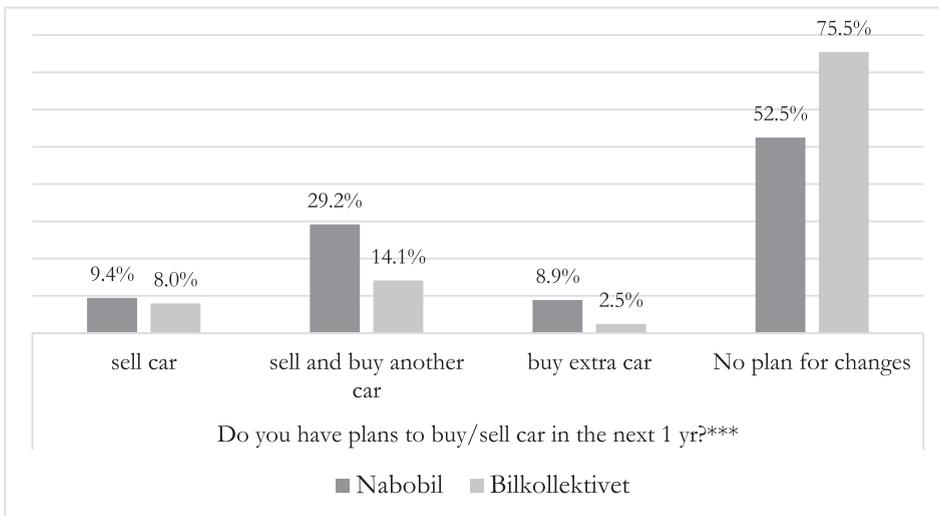
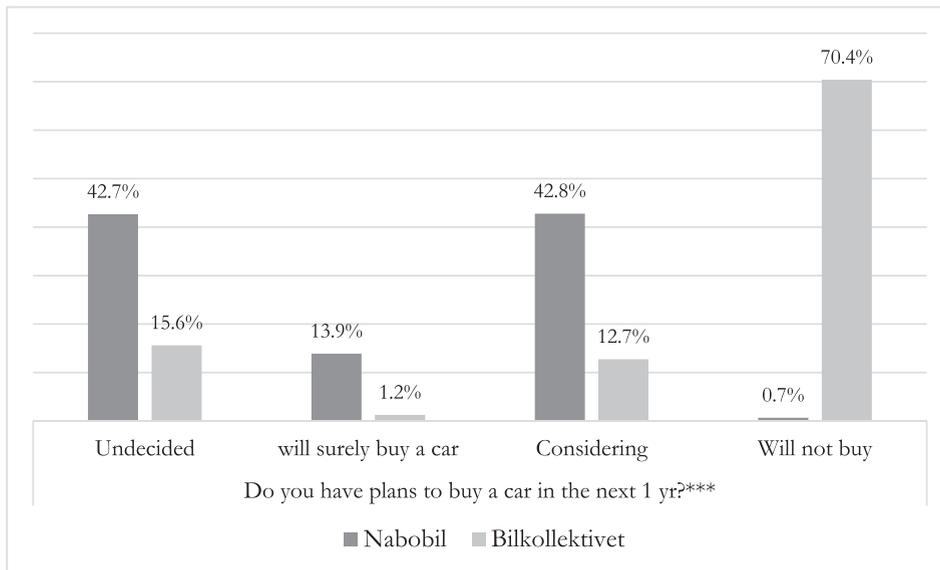


Fig. 16. Plans for car transactions if the respondent (or someone in household) owns or leases a car. \*\*\* mean scores are significantly different for the two groups,  $p < 0.001$ .



**Fig. 17.** Plans for buying a car if the respondent (or someone in household) does not own or leases a car. \*\*\* mean scores are significantly different for the two groups,  $p < 0.001$ .

Future plans for car transactions and purchase also varies significantly between these two user groups, which reflects a combination of materiality and meaning attached to cars for these respective groups. It emerges that the *Coop* members can be categorized as the ‘serious’ car share users whereas the P2P members lean towards more ‘playful’ users leaning strongly towards the culture of automobility (see Figs. 16 and 17).

### 5.2. Multivariate analysis

We have used principal component analysis (PCA) and regression analysis to delve deeper into the characteristics of car sharing in Oslo, and how life events may influence the uptake of *Coop* and P2P. As outlined in our research model, we use motive, car ownership history as well as access to parking and public transport as indicative mediating variables. In this section, we explore how life events of car sharing users affected their decisions to start using either P2P or *Coop*. Our key interest lies in investigating the relationships between life events, the mediating factors and use of a particular car sharing scheme.

#### Principal component analysis<sup>3</sup>

**Table 7**

Factor loadings. Rotated and sorted component matrix (Note: Factor scores below 0.4 are not included).

	Component		
	Children	Relocation	Leisure
Birth of my/our child (not first)	0,775		
Birth of my/our first child	0,748		
Child in household began day care, kindergarten or school	0,685		
Other activities			
Relocated to my current residence		0,738	
Moved in with partner or roommate(s)		0,714	
Began studying		0,503	
Changed jobs		0,426	
I or someone in my household began a leisure activity that requires transport			0,780
Moved out from a residence with partner or roommates			0,428

Life events are rarely completely isolated from each other (Müggenburg et al., 2015) and it is to be expected that some life events

<sup>3</sup> Running the PCA for each car sharing type produced largely the same components, although the strength of the components varied a bit for each type. For the clarity of the analysis presented here, we preferred to run the PCA for the whole data set and then explore variations between the two user groups.

are closely correlated. To capture some of these ‘bundling of events’, we conducted a principal component analysis based on the nine events specified and the indication of their importance for the decision to shift to car sharing. To further understand the impact of life events, we reduced the nine variables to three key factors containing events that showed tendencies of operating together in the sample. The importance of these events was indicated by the respondents. An orthogonal factor analysis with Varimax rotation was conducted. Bartlett’s test of sphericity indicated that the correlations between the variables were different from 0 (sig = 0.000). Kayser-Meyer-Olkin’s measure for sampling adequacy is 0.617, indicating acceptable levels for further analysis. Using Eigenvalues greater than 1 as a criterion for the number of factors to extract generated a three-factor solution (see Table 7).

The three factors cumulatively explained 45% of the variation, and only to a limited degree did adding more components improve explained variance. The first and strongest component contains three variables related to child birth (first or later) and/or children starting at day care, kindergarten or school. These life events are labelled/grouped as *Children in household*. The second component included four variables that related to relocations due to studies or job shifts. This factor has been labelled as *Relocation*. The third component contains statements related to shifts in activity patters, most strongly starting with new leisure activities or also (to a lower degree) a household split. We will here label this component as *Leisure activity*. In the following analysis, we have applied these three factors as independent life event variables.

*Regression analysis*

**Table 8**  
Logistic regression for use of car sharing scheme. (Coop = 1).

	B	Wald	Sig	Exp (B)
<i>Life events (importance)</i>				
LE 1-Children	0,352	16,719	0,000	1,423
LE2- Relocate	-0,297	17,429	0,000	0,743
LE3- Leisure	-0,067	1,025	0,311	0,935
<i>Motives</i>				
Inclusive	0,338	51,907	0,000	1,402
Practicality	0,132	10,443	0,001	1,142
Environmental	0,097	5,827	0,016	1,102
Cost saving	-0,168	12,004	0,001	0,846
Car sharing Identity	0,087	4,203	0,040	1,091
Car identity	-0,119	8,851	0,003	0,888
<i>Context</i>				
PT distance (neg)	0,056	0,207	0,649	1,058
Parking access	-0,148	20,017	0,000	0,863
<i>Car owner history</i>				
Dont have, but previously owner	-0,176	1,041	0,308	0,838
Have car now and previous owner	-1,055	24,378	0,000	0,348
<i>Demography</i>				
Gender	0,026	0,032	0,857	1,026
Age	0,019	6,582	0,010	1,019
Education	0,417	17,503	0,000	1,517
Income (household)	0,234	17,732	0,000	1,264
Constant	-2,419	11,626	0,001	0,089
<i>Model summary</i>				
n	2856,000			
-2LL	1422,456			
Nagelkerke R square	0,361			

Our assumption is that the life events have different effects for the P2P and *Coop* forms of sharing. In order to investigate this further, a generalized linear regression model with negative binomial distribution was used with the car sharing scheme as the dependent variable (*Coop* = 1). In addition to the three life event components, indicative variables for motivations, car ownership history, and the external environment was included. Summary results are given in Table 8.

Results show that the three life event factors had very different influences on the two schemes. While the first factor (Children in the household) significantly influenced use of traditional cooperative car sharing, the second (Relocation) had, in contrast, influenced uptake of P2P. Thus, the individuals that had experienced child birth(s) (and related changes) tended to turn to traditional member-based car sharing, while those who had relocated tended to prefer the P2P schemes.

However, results also highlight that several other (mediating) factors were involved, as assumed in the conceptual model. The P2P users were significantly more motivated by cost saving while the *Coop* users had stronger practical, social and environmental motives. The difference is also reflected in self-identities, where the *Coop* users saw themselves as having a car sharing identity, in contrast to the P2P users who had a stronger identity as car drivers. For P2P model, cost-related and very different symbolic motives (identity as car driver) was influential. This shows that both life events and intrinsic factors were involved in the selection of car sharing type. Interestingly, former car ownership as well, as present ownership, were influential for the P2P users. In contrast, the *Coop* users were, to a much larger extent, previous non-owners, and relied solely on shared cars. As assumed in the model, the physical environment was influential for the car sharing mode choice as well, highlighting that poor parking facilities significantly influenced members of the *Coop* scheme but not the P2P users.

Summing up, these results clearly indicate that different life events influence the modal shift to P2P and *Coop* platforms, but that the decision to adopt a particular form of sharing is also affected by motives and contextual issues.

## 6. Conclusion and discussion

Carsharing has had a steep growth curve in Oslo, and with a continued focus on restraining private car growth and promoting sustainable modes of transport at all levels of governance, it is desired that car sharing gains further momentum in the future as well. We have used a combination of mobility biographies and practice theory framework to discuss the differentiated patterns of car sharing usage and implications for future planning. This paper's combined theoretical approach provides tools for (1) targeting potential users of a new technology or service and (2) adapting the new technology or service to best suit particular user groups. For example, the P2P and *Coop* platforms differed in the extent to which they were able to attract students, parents of young children, people with high/low levels of social trust, and environmental meaning.

### 6.1. Meanings and skills associated with car sharing

The survey results indicate that the meanings associated with freedom and the environment vary between the different user groups and that a stronger association is exhibited by the *Coop* users.

Car sharing provides users with new freedoms – freedom from many of the burdens associated with the dominant mobility practices like parking, maintenance, etc. At the same time, it takes away the freedom associated with uninterrupted supply of a car. How these two sides of freedom evolve will have a big impact on the retention of practitioners and related reproduction of the practice.

As with other forms of sharing, car sharing is predicated on reputation or trust in other users and the institution that governs the collective (Botsman, 2012). By allowing users to operate independently of one another, automobility has developed without the need for such trust during transactions. Car sharing necessarily makes the user more dependent on other users, not only temporally and spatially, but also with respect to how well they treat the car.

The results highlight that users of *Coop* had a higher level of interpersonal trust than the P2P users. It seems that this trust is carried forward at the institutional level as well. As George (2018) records in an interview-based study among the car users, “Although the informants in the study were eager to support a non-corporate business model, they were hesitant to engage with P2P providers because they did not feel individual ‘peers’ were held accountable”. The cooperative model strikes the perfect balance between alternative business model and institutional trustworthiness. If car sharing and other shared goods and services are to gain in popularity, there must be ample institutional trust or reputation that is capable of off-setting any suspicion or lack of trust users may have among one another.

Although the *Coop* platform is the oldest and most popular car sharing option in Oslo, residents there are adept at using peer-to-peer (internet based) trading platforms (e.g. *Finn.no*<sup>4</sup>) to an extent that we can confidently state that the P2P interface is a well-rehearsed practice among potential users. But despite the presence of an easily accessible P2P option, the *Coop* platform in Oslo commands higher usage and popularity. We see a reinforcement of the fact that the cooperatives do not run solely as a business model but is a part of a specific highly motivated/motivating social imaginary.

Future research, policies and programmes can both contribute and draw from the theories of social practice, by exploring the ways in which new social behaviours/technologies get embedded and the business models that facilitate the embedding of routinized practices. If, for example, a cooperative-style, community-oriented environment could significantly enhance the uptake and retention of car sharing, then the urban and regional authorities could look into mechanisms for promoting cooperative-based schemes.

### 6.2. The collective and spatial context

Whereas previous market analyses do differentiate user groups, our combined theoretical approach has allowed for a more comprehensive analysis based on how users relate to their environment and other mobility options. Car sharing has a vital spatial dimension; it requires not just the existence of users and vehicles, but a geographic concentration of them as well.

Our results suggest that population density alone is not sufficient to foster adoption. For example, users of P2P were more likely to automatically consider a car for daily travel, whereas *Coop* users were more likely to automatically consider public transit or bicycling. Spatial proximity to transit stops, high frequency of public transport services, walking/cycling infrastructure and, to a great extent, restricted parking are all material elements that favor car sharing. In municipal peripheries, with lower concentrations of these material elements, as well as shared cars and users, car sharing became much less attractive.

The prevalence of car sharing is strongly linked with how urban a context is. Prior research (Kent and Dowling, 2013) has already shown that car sharing tends to succeed in denser, walkable and transit-oriented areas. This study builds on this research by providing a more in-depth analysis of users and the adoption process, by combining practice theory and the mobility biographies perspectives.

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<sup>4</sup> “*Finn.no* is a Norwegian classified advertisements website with sections devoted to jobs, housing, cars, for sale, travel, and services. The website was established in March 2000, and currently has 320 employees. This is the largest Norwegian website in number of page-views and has around 3.5 million users a week according to TNS Gallup. Norwegians spent an average of 19.5 h each on the website in 2011”. <https://en.wikipedia.org/wiki/Finn.no> An extremely good supply of high-speed internet services since the late 1990s and deep penetration of personal PCs and smart devices in Norway has also contributed to the explosive growth of *Finn.no*.

Oslo is a city in transition that is actively promoting a shift from car-based daily mobility to a more sustainable one. Innovative and emerging solutions like car sharing fit this anticipated shift very well given that the daily share of mobility will be catered to by sustainable modes whereas the weekly and monthly off-shoots of the current mobility system, which are dependent on automobility, are taken care by car sharing.

Urban context in particular was seen as important among the sampled respondents. By urban context, we do not mean merely being in a city, but in (relatively) densely populated areas that are well-suited for walking, bicycling and public transit. In cities like Oslo, car sharing, which is typically used on an occasional basis, depends on effective public transit and active transit options that can meet the demands of everyday mobility. Importantly, the significance of urban residency extends beyond such utilitarian concerns or traveling from point A to point B. Urban areas are also associated with social and cultural resources and meaning such as demographic diversity and access to sports and cultural activities.

Urban residency provides not only the optimal mix of active and public transit that would make car sharing practical, but it also delivers the social and cultural meaning that many car sharing users deem to be important. Such knowledge is of importance with respect to the targeting of users as well as marketing to them. Rather than merely using the language of cost savings, convenience and environmental sustainability to market car sharing, there is an opportunity to frame car sharing as an integral part of an urban lifestyle.

### 6.3. Recommendations for promoters

Practice theory's biggest potential contribution is in highlighting and explaining user adoption of innovations as a process of recruitment and retention that results in the integration and reproduction of new practices that replace old ones. Practice theory provides for a richer and more detailed understanding of the micro-phenomena that takes place at different life stages whereby users at these stages can be targeted in the right manner through a combination of taxation, welfare and marketing strategies.

The users of *Coop* and P2P platforms engage with car sharing differently; their life-stages, conditions and circumstances differs as well. P2P, for example, was shown to be more popular among students, whereas *Coop* was shown to be more popular among new parents. As the car sharing market in Oslo matures, a potential line of future research would be to track and analyze the behavior of car sharing users across multiple life stages.

This set of knowledge, on user variations, offers promoters (both policy makers and service providers) tools with which the practice of car sharing can be upscaled to a mainstream or dominant mode of transport. The relationship between users and promoters is not static, but co-evolutionary. Promoters respond to how users actually use their products and services. The question to be asked is: What is missing in platform design and adoption? How can design promote trust? How can car sharing be better integrated with other forms of urban mobility?

Transport policy making in Norway and Oslo is primarily linked to combating the causes and effects of climate change and local pollution (Oslo Municipality, 2015; Oslo Municipality and Akershus County Council, 2015). And though the environmental associations are ranked high by both P2P and *Coop* users, the ways in which this gets embedded in their daily lives differ for the two groups. Government promoters would do well to understand how the environmental meaning operates. If environmental meaning is a better retention mechanism than a recruitment mechanism, then appeals to environmental sustainability or reduced carbon footprint are not likely to change user behavior. Following the identification and application of other more effective (marketing and) recruitment mechanisms, the environmental meaning of car sharing may hold more weight and help sustain a transition.

Furthermore, if the long-term goal of policy makers is to facilitate more sustainable modes of urban mobility, it is worthwhile to consider which types of car sharing are preferred. According to the Norwegian Government's "zero growth objective", all expected increases in transportation demand in the country's largest metropolitan areas are to be met through walking, biking and public transit. Our results indicate that the users of the *Coop* were more likely to walk, bike or take public transit on a daily basis, and that the P2P users were more likely to drive on a daily basis. This suggests that for the *Coop* users, car sharing was merely, but also importantly, a mobility option that was availed of only when walking, biking and public transit were not sufficient.

However, considering that the P2P platform is relatively new and has undergone rapid growth in its first few years, it would not be unreasonable to assume that its market share, public image and user profile would change in the coming years. It would, furthermore, be premature to state what the broader implications are for the urban mobility system in Oslo. It would be worthwhile, though, for policy makers to differentiate between different types of car sharing when formulating regulations and incentives.

This paper establishes a baseline with which to compare subsequent investigations into user practices among different car sharing providers. A follow-up study that looks into the P2P platform as an established provider would be a worthwhile endeavor.

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## References

- Andersson, M., Hjalmarsson, A., Avital, M., 2013. Peer-to-peer service sharing platforms: driving share and share alike on a mass-scale. Paper Presented at the Thirty Fourth International Conference on Information Systems, Milan. Available at <https://pdfs.semanticscholar.org/a5d1/c8142c5b5e83166745a00d59a-fa74b189397.pdf>.
- Beige, S., Axhausen, K.W., 2009. Interdependencies between turning points in life and long-term mobility decisions. *Transportation* 39, 857–872.
- Botsman, R., (2012, August 20). Welcome to the new reputation economy. WIRED. Retrieved from <http://www.wired.co.uk/article/welcome-to-the-new-reputation-economy>.
- Chatterjee, K., Sherwin, H., Jain, J., 2013. Triggers for changes in cycling: the role of life events and modifications to the external environment. *J. Transport Geography* 30, 183–193.
- Chatterjee, K., Scheiner, J., 2015. Understanding changing travel behaviour over the life course: Contributions from biographical research. In: Paper Presented at the 14th International Conference on Travel Behaviour Research, Windsor, UK, 19–23 July 2015.
- Clark, B., Lyons, G., Chatterjee, K., 2016. Understanding the process that gives rise to household car ownership level changes. *J. Transport Geography* 55, 110–120.
- Degirmenci, K., Breitner, M.H., 2014. Carsharing: A literature review and a perspective for information systems research. In: Beckmann, Lars (Ed.), *Multikonferenz Wirtschaftsinformatik (MKWI 2014)*, 26–28 February 2014, Paderborn, Germany. Available at: <https://eprints.qut.edu.au/105684/>.
- Frost, Sullivan, 2012. Business Models and Opportunities in the European Traditional and Peer-to-Peer Carsharing Market. M813.18. [www.frost.com](http://www.frost.com).
- Frost, Sullivan, 2012. Business Models and Opportunities in the North American Traditional and Peer-to-Peer Carsharing Market. NB-0018. [www.frost.com](http://www.frost.com).
- Frost, Sullivan, 2012. Executive Analysis of the Carsharing Market in APAC. P5F7-18. [www.frost.com](http://www.frost.com).
- George, C., 2018. User adoption of innovations in a sustainability transitions context, a practice theory analysis of car sharing and urban mobility behavior in Oslo. Master's Thesis, Centre for Technology, Innovation and Culture, Faculty of Social Sciences, University of Oslo.
- Greene, M., Rau, H., 2016. Moving across the life course: A biographic approach to researching dynamics of everyday mobility practices. *J. Consumer Culture* 1–23.
- Harms, S., Truffer, B., 1998. The emergence of a nation-wide carsharing co-operative in Switzerland. A case-study for the EC-supported research project "Strategic Niche Management as a tool for transition to a sustainable transport system", EAWAG, Zürich.
- Hawlitshchek, F., Teubner, T., Gimpel, H., 2018. Consumer motives for peer-to-peer sharing. *J. Cleaner Prod.* 2014, 144–157.
- Jensen, M., 1999. Passion and heart in transport - a sociological analysis of transport behaviour. *Transport Policy* 6, 19–33.
- Kent, J.L., Dowling, R., 2013. Puncturing automobility? Carsharing practices. *J. Transport Geography* 32, 86–92.
- Lanzendorf, M., 2010. Key events and their effect on mobility biographies: The case of child birth. *Int. J. Sustain. Transportation* 4 (5), 272–292.
- Millard-Ball, M., Murray, G., Ter Schure, J., Fox, C., Burkhardt, J., 2005. Car-sharing: where and how it succeeds. Transit Cooperative Research Program (TCRP) Report 108. Transportation Research Board, Washington.
- Müggenburg, H., Busch-Geertsema, A., Lanzendorf, M., 2015. Mobility biographies: A review of achievements and challenges of the mobility biographies approach and a framework for further research. *J. Transport Geography* 46, 151–163.
- Noppers, Ernst H., Keizer, Kees, Bockarjova, Marija, Steg, Linda, 2015. The adoption of sustainable innovations: The role of instrumental, environmental, and symbolic attributes for earlier and later adopters. *J. Environ. Psychol.* 44, 74–84.
- Norwegian Ministry of Transport and Communications, 2017. National Transport Plan. Meld. St. 33 (2016–2017) Report to the Parliament (white paper) 2018–2029. Available at: <https://www.regjeringen.no/contentassets/7c52fd2938ca42209e4286fe86bb28bd/en-gb/pdfs/stm201620170033000engpdfs.pdf>.
- Oslo Municipality, 2015. Kommuneplan 2015: Oslo mot 2030. [Municipal Plan 2015: Oslo towards 2030]. Available at: <https://www.oslo.kommune.no/getfile.php/1374699/Innhold/Politikk%20og%20administrasjon/Politikk/Kommuneplan/Ny%20kommuneplan%202015/Kommuneplan%202015%20del%201%20justert%2031.01.2017.pdf>.
- Oslo Municipality & Akershus County Council [Oslo Kommune & Akershus Fylkeskommune], 2015. Regional plan for areal og transport i Oslo og Akershus [Regional plan for land use and transportation in Oslo and Akershus]. Available at: <https://www.oslo.kommune.no/getfile.php/13114975/Innhold/Plan%20c%20bygg%20og%20eiendom/Overordnede%20planer/Regional%20plan%20for%20areal%20og%20transport%20i%20Oslo%20og%20Akershus.pdf>.
- Pantzar, M., Shove, E., 2010. Understanding innovation in practice: a discussion of the production and re-production of Nordic Walking. *Technol. Anal. Strategic Manage.* 22 (4), 447–461. <https://doi.org/10.1080/09537321003714402>.
- Rau, H., Manton, R., 2016. Life events and mobility milestones: Advances in mobility biography theory and research. *Journal of Transport Geography* 52, 51–60.
- Reckwitz, A., 2002. Toward a theory of social practices: a development in culturalist theorizing. *Eur. J. Social Theory* 5, 243–263.
- Sattlegger, L., Rau, H., 2016. Carlessness in a car-centric world: A reconstructive approach to qualitative mobility biographies research. *J. Transport Geography* 53, 22–31.
- Schatzki, T., 2011. 'Where the Action Is (On Large Social Phenomena Such as Sociotechnical Regimes)' SPRG Working Paper 1, Lancaster <http://www.sprg.ac.uk/uploads/schatzki-wp1.pdf>.
- Scheiner, J., 2007. Mobility biographies: elements of a biographical theory of travel demand. *Erdkunde* 61, 161–171.
- Schoendude, R., Mueller, M.G., Peters, A., Lanzendorf, M., 2015. Analysing mobility biographies with the life course calendar: a retrospective survey methodology for longitudinal data collection. *J. Transport Geography* 42, 99–109.
- Shaheen, S., Cohen, A.P., 2008. Worldwide Carsharing Growth: An International Comparison. Institute of Transportation Studies. Available at: <http://escholarship.org/uc/item/1139r2m5>.
- Shaheen, S.A., Cohen, A.P., 2007. Growth in worldwide carsharing: An international comparison. *Transportation Research Record* 1992 (1), 81–89.
- Shaheen, S., Cohen, A.P., 2013. Carsharing and personal vehicle services: worldwide market developments and emerging trends. *Int. J. Sustain. Transportation* 7 (1), 5–34.
- Shaheen, S.A., Cohen, A.P., Chung, M.S., 2009. North American carsharing. *Transportation Res. Rec.: J. Transportation Res. Board* 2110 (1), 35–44.
- Shaheen, S., Sperling, D., Wagner, C., 1998. Carsharing in Europe and North America: Past, Present, and Future. UC Berkeley: University of California Transportation Center. Retrieved from < <https://escholarship.org/uc/item/4gx4m05b> > .
- Shove, E., Walker, G., 2010. Governing transitions in the sustainability of everyday life. *Res. Policy* 39 (4), 471–476.
- Shove, E., Pantzar, M., Watson, M., 2012. *The Dynamics of Social Practice: Everyday Life and how it Changes*. SAGE Publications.
- Spears, S.P., 2008. Beyond the early adopters: examining the potential for car-sharing in Richmond, Virginia. Virginia Commonwealth University, Virginia Available at: <https://scholarscompass.vcu.edu/cgi/viewcontent.cgi?article=1659&context=etd>.
- Steg, Linda, 2005. Car use: lust and must. Instrumental, symbolic and affective motives for car use. *Transportation Res. Part A* 39 (2–3), 147–162.
- Waerden, P. Van der, Timmermans, H., Borgers, A., 2003. The influence of key events and critical incidents on transport mode choice switching behavior: A descriptive analysis. Paper presented in 10th International Conference on Travel Behavior. Lucerne.
- Watson, M., 2012. How theories of practice can inform transition to a decarbonized transport system. *J. Transport Geography* 24, 488–496. <https://doi.org/10.1016/j.jtrangeo.2012.04.002>.
- William, L.H., 2013. Carsharing. A Study of the Difference Between Carsharing Provided by Automakers and New Market Entrants. Copenhagen Business School, Copenhagen Available at: [http://studenttheses.cbs.dk/bitstream/handle/10417/4654/lisa\\_holst\\_williams.pdf?sequence=1](http://studenttheses.cbs.dk/bitstream/handle/10417/4654/lisa_holst_williams.pdf?sequence=1).