WHOM TO HANG OUT WITH AND WHERE? ANALYSIS OF THE INFLUENCE OF SPATIAL SETTING ON THE CHOICE OF ACTIVITY COMPANY

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ABSTRACT

Over the past decade there has been an increasing interest into to role of social interactions and social networks for activities and travel. This coincides with a growing awareness that social and recreational trips make up a considerable share of total mobility and deserve more attention in order to understand trends in mobility. Given this trend remarkably little attention has been given to the investigation of the choice of company for social and recreational activities and travel. This paper contributes to filling this gap, by presenting estimation results of models of company choice for social activities, shopping, sport and recreation and cultural activities, based on activity diary data collected in 2007 in the Netherlands. Specific attention is given to the influence of urban form and accessibility of services on company choice. The estimation results suggest that accessibility of facilities has an impact on company choice. However, the mechanisms seem to differ between activity types. For social activities, shopping and sports/recreation, it seems that better access to facilities leads to more joint activity participation, presumably because coordination between involved parties in time and space becomes easier. In other cases (social and cultural activities), close access to facilities seems to lead to a higher probability of single activity engagement, possibly since impulsive activities (usually single) are easier to implement and pooling of facilities is not necessary.

Keywords: social activities, company, urban form

INTRODUCTION

Over the past decades, the theoretical underpinning of travel behaviour research has been greatly improved. Starting from the traditional four stage modeling paradigm (Ortuzar and Willumsen, 1990), which represented travel as the outcome of subsequent decisions regarding trip, generation, destination choice, mode choice and route choice, a major step forward was made by the activity-based approach (Kitamura, 1988; Ettema and Timmermans, 1997). Activity-based theory emphasized the fact that travel should be regarded as a derivative of activities. That is to say, to understand travel, we should have insight in how individuals schedule their activities in time and space, leading about decisions where and when to go, by which mode to get there and with which company. An important consideration of the activity-based approach is that activities throughout the day are interrelated. This stems from the fact that available time during the day is limited, with the implication that the time spent on one activity (or the feasibility of engaging in an activity at all) depends on the choice of other activities and the time spent on those. Further interdependency is related to the spatial organization of activities. The location of one activity combined with its duration sets limitations to the feasible locations for other activities, given constraints implied by travel times. Or, in reverse, a given location for an activity may lead to restrictions in activity duration, or prevent engagement in the activity in the first place, given the locations and durations of other activities and given the speed of available travel options. Basically, the constraints to activity participation set by the spatio-temporal organization of other activities and travel modes were termed authority constraints by Hägerstrand (1970) in his seminal paper, and they constitute an important component of time-geography, which is closely related to the activity-based approach in travel behavior research.

Thus, an important notion in activity-based travel research is that the spatial setting as well as the spatial organization of activities and functions has an important impact on individuals' decisions to engage in activities. This awareness has spawned a considerable amount of research into the relationship between spatial setting (usually referred to as urban form) and activity and travel patterns. For some researchers, the underlying motivation for such research has been the belief that activity and travel behavior can be positively influenced by changing the spatio-temporal organization. In particular, the new urbanism movement has assumed that by building in higher densities and by realizing mixed land use, individuals can be made to choose slow modes and public transport more often, since trips will be shorter and activities can be more concentrated in space. Many scholars have empirically scrutinized the relationship between urban form and activity and travel behavior. While some scholars have claimed that design characteristics of the built environment impact on mode choice and trip making most empirical studies (e.g. Cervero and Gorham, 1995; Boarnet and Crane, 2001; Cervero and Duncan, 2003; Zhang, 2004) find at best mixed evidence for the effect of built environment on activities and travel.

Another development stemming from the activity-based approach is an increased interest in the social aspects of activity and travel behavior. As part of time-geography, Hägerstrand (1970) emphasized the existence of coupling constraints, implying limitations to activity and travel patterns caused by the obligation or need to be with other individuals (family, colleagues) at certain places at certain times of the day. Taking this argument one step further, transportation researchers have realized that individuals' decision about travel and activities are intrinsically linked to those of other individuals in a way that cannot simply be described in terms of constraints. In fact, decisions about activities and travel patterns or often decisions made jointly with others and in which decisions about joint activities and travel play an important role. Various studies have been carried out along those lines. Focusing on households, various scholars have focused on the allocation of time to individual and joint activities (e.g. Zhang and Fujiwara, 2006). Gliebe and Koppelman (2003) applied an adjusted logit modeling techniques describe similar processes. Srinivasan and Bhat, (2006) introduced a discrete-continuous modeling framework to describe how spouses allocate time to various activities, and how these decisions are mutually related. Although they found many significant interactions between spouses, a limitation of their approach is that it does not clearly distinguish between individual and joint activity engagement. Schwanen et al. (2007) used a structural equation model to describe how joint engagement in various activities depends on socio-demographic variables, but is also subject to substitution between activities and trade-offs between joint and solo participation . Recognizing that activity and travel behavior is not only affected by interaction with the spouse, Bradley and Vovsha (2005) focused on the role of children in shaping their parents' activity and travel patterns. More precisely, they propose a model to describe the choice who accompanies children to/from school and how this affects parents' activity scheduling and mode choice.

While these models provide very relevant insights into interactions between individuals in the context of activities and travel, their scope remains limited to only household interactions. Yet, activities undertaken with others, such as family (beyond the household), friends or colleagues (outside work) constitute other important categories of travel and activities. For instance, Axhausen (2008) shows that a considerable share of activities and travel in various western societies is related to social, recreational and leisure purposes. For various reasons, this share is expected to further increase in the decades to come (Schad and Ohnmacht, 2009). Bhat and Srinivasan (2008) indicate that a large share of such travel and activities is undertaken in company of non-household members. In other words, to better understand an increasingly important category of travel, it will be important to gain insight into the company associated with these activities and travel and how the company relates to decision about frequency, location, duration and travel mode associated with these joint activities. Some insights are offered by recent work on the relationship between social networks and travel (Carrasco and Miller, 2006; Axhausen, 2008; Ettema and Kwan, 2009; Urry, 2003). These studies suggest that size and composition of the

social network have a relevant impact on individuals' social and recreational activities and associated travel, providing further support for the assumed importance of insight into company for understanding social/recreational travel. Literature in this area suggests that joint activities are undertaken for reasons of giving/receiving support or advice, maintenance of social relations, reciprocity as well as enjoyment, identification an confirmation of status.

Although studies in this field have revealed valuable insights into the relationship between social interaction and travel, many aspects remain to be investigated with respect to the exact implications for travel and activity behavior. This paper aims to contribute to the insight into the impact of social relationships and travel by focusing on the choice of company for social-recreational activities. In activity-based travel models, choice of company is often limited to choice of household members, whereas in the above we have indicated the importance of other types of company for understanding travel behavior. In particular, we will focus on choice of company for social and recreational activities, where company is split into household member, family, friends and colleagues. In recognition of the role of spatial context, as indicated before, we will include spatial setting as an important category of explanatory variables. In other words, we will investigate how spatial context influences the choice of company for various SR activities. In this respect we will draw on the work by Fan and Khattak (2009) who investigated how the decision whether to engage in activities individually or jointly was affected by the vicinity of facilities, such as parks shopping malls etc. They found that especially vicinity to parks lead to greater probabilities of joint activity engagement. From a theoretical point of view (as also highlighted in the social networks literature), this suggests that individuals need facilities to support social interaction with others in order to achieve the desired outcomes of social interaction mentioned above. As a consequence, the spatial setting determines to what extent in in what form social interactions (in the form of joint activities) take place. While building on the work by Fan and Khattak, our paper extends it in that the range of companies considered is broadened considerably. Whereas Fan and Khattak (2009) limit the decision of company to joint vs. alone, we use a broader set of company types. In addition, it will be interesting to see whether to impact of built environment on company choice differs between a North-American and a European (in this case Dutch) setting.

This paper is organized as follows. In the next section, we discus details about data and research design, followed by the results and concluding remarks.

RESEARCH DESIGN AND DATA

Models

The aim of the paper is to investigate how choice of company is affected by spatial context. To this end, we will estimate multi-variate models in which company is the dependent model. We will start with logistic regression models of binary choice whether to engage in activities individually or jointly with others. Next, we will apply multinomial logistic regression models of choice between solo activity engagement, company of family and company of friends/colleagues as function of socio-economic characteristics of households and accessibility attributes of residential location.

Since our aim is to test the influence of spatial setting on company choice, the explanatory variables entail an extensive list of spatial context variables. These variables concern characteristics of the residential zone of the respondent (such as number of workers in various sectors in the zone) as well as measures of accessibility of facilities (such as stores, services, restaurants etc.) from the residential zone. These variables include various indicators, such as floor space, number of workers in a sector etc. that can be accessed by various transport modes in various travel times. We deliberately tested a wide variety of spatial variables, to find out which types of facilities affect company choice for SR activities, but also at what distance they are at play. A full overview of the spatial variables is given in Table 1.

Table 1: List of spatial variables

Variable ID	**Variable name**
UD	Urbanization degree
Work_Hotel_Slow	Number of workers in hotels within 15 slow-distance minutes (<=3.75km)
Work_Culture_Slow	Number of workers in culture sector within 15 slow-distance minutes (<=3.75km)
Work_Service_Slow	Number of workers in service sector within 15 slow-distance minutes (<=3.75km)
Work_Hotel_Car	Number of workers in hotels within <=20 car time minutes
Work_Culture_Car	Number of workers in culture sector within <=20 car time minutes
Work_Total_Near	Total number of workers within <=20 car time minutes
Work_Total_Far	Total number of workers within <=40 car time minutes
Culture_Slow	Distance to the nearest cultural center in slow-distance minutes
Service_Slow	Distance to the nearest service center in slow-distance minutes
DShop_Slow	Distance to the nearest daily shopping in slow-distance minutes
Rail_Slow	Distance to the nearest railway station in slow-distance minutes
Culture_Car	Distance to the nearest cultural center in car-time minutes
Service_Car	Distance to the nearest service center in car-time minutes
DShop_Car	Distance to the nearest daily shopping in car-time minutes
NDShop_Car	Distance to the nearest non-daily shopping in car-time minutes
Rail_Car	Distance to the nearest railway station in car-time minutes
FS_DShop_Slow	Floor space of daily shopping within 15 slow-distance minutes (<=3.75km)
FS_NDShop_Slow	Floor space of non-daily shopping within 15 slow-distance minutes (<=3.75km)
FS_DShop_Car	Floor space of daily shopping within 20 car-time minutes
FS_NDShop_Car	Floor space of non-daily shopping within 20 car-time minutes

Since obviously not only spatial variables influence company choice, we included a set of socio-demographic control variables (presented in Table 2). Of these socio-demographic variables, especially household composition (whether it is a one person household, household with young children or without young children) is likely to have a significant impact of travel company.

Table 2: List of Socio-demographic variables

Variable ID	**Variable name**
Age	Age of respondent in years
Gender	0 if female
Education	Education level of respondent: Primary, LTS. HAVO, MTS, Bachelors/Masters
Income	Net monthly income level of household
Working_hrs	Working hour of respondent per week
Single	1 if respondent lives alone
Without_child	1 if respondent lives together without children 13 years or younger
With_child	1 if respondent lives together with children 13 years or younger
Driving_license	1 if respondent has a driving license
Car	1 if the number of car is true
Dual_income_HH	1 if it is a dual income household
Children_at_home	1 if there are children at home
own_house	1 if the residence is owned
rent_house	1 if the residence is rented
Row_house	1 if it is a row house
Semi_detached	1 if it is a semi detached house
Apartment	1 if it is an apartment
Shared_housing	1 if it is a shared house
Other	1 if it is another type of house

Data

The empirical analyses were carried out with two datasets. The first dataset was collected in the Utrecht-Amersfoort- Hilversum region in 2007. This part of the Netherlands is more service oriented and more urbanized than other parts, suggesting that fragmentation might frequently occur. The survey was conducted among single and dual-income households. The collection of data took place in several stages. Initially, selection questionnaires were sent to around 13,500 respondents living in different neighbourhoods in the research area; neighbourhoods were then selected on the basis of a combined income, density, and accessibility matrix. In total, 26 areas were selected, according to income, density, and accessibility levels. In the following stage, we determined the number of addresses to be sampled per neighbourhood; addresses within each neighbourhood were selected randomly using digital files containing all street addresses. The selection questionnaire contained questions about general household characteristics, the possession of ICT devices, and whether the addressee would like to participate in the main survey. Those respondents who were willing to participate in the main survey were sent a questionnaire and a 2-day

combined activity-travel-communication dairy. In total, the questionnaire was completed by approximately 740 people, either online or in a mail-out/mail-back paper-and-pencil format. The activity and communication diary was completed by 662 respondents (only paper-and-pencil format). They were asked to complete the details about their activities (the location, start/end times, and with whom). With regard to the ICT questionnaire, the respondents indicated how often they used different types of ICT devices (i.e., landline and mobile phones, PDA, laptop with internet) for work and /or private purposes. With regards to the travel, people were asked to provide us with the origin and destination, type of transport mode, duration, and activity of each trip. Details about this data can be consulted in Hubers et al. (2008) and Alexander et al. (2008). For our analysis, we considered four types of activities, namely, social, shopping, sports and recreation and cultural (detailed in Table 3).

Table 3: Definition of activities

Type of activities	**Definition**
Social	social activities (visit family, acquaintances, etc.)
	going out (for dinner, bar, disco, etc.)
Shopping	all shopping excluding daily shopping (like supermarket, butcher, grocery, etc.)
	services (post office, bank, snack bar, library, hairdresser, video shop, etc.)
Sports and Recreation	practicing sports (also fitness, aerobics, etc.)
	recreational activity (swimming pool, amusement park, nature, park,etc.)
Cultural	cultural activity (cinema, museum, concert, etc.)

The original dataset was further screened for empirical analysis of the fragmentation of work activity. For this study we screened the data for only out-of-home activities of the four types presented in table 3. After the screening process, 425 individuals provided useful information for the analysis and 872 person-days were made available for the empirical analysis.

It should be noted that our sample slightly overrepresented high-level professionals: 45 percent of the respondents were highly-educated professionals (scientific, technical, healthcare, ICT, and so forth).

The shares of men and women in the sample are 47.7percent and 54.3 percent respectively. In terms of working hours, the mean value is 31.86 hours per week. However, a considerable difference is observed between men and women: men worked on average 36.31 hours per week, while females worked 28.02 hours per week. An overview of the sample characteristics is given in Table 4.

The second dataset is a detailed land use database containing accessibility measure of all six-digit postcodes in the Netherlands. This data was collected in 2000 and provides the spatial variables (Table 1) for this analysis. We combined these two datasets based on their six-digit postcodes as the key variable, assuming that land use

did not change noticeably in 4 to 5 years. Thus we obtain a combined database including accessibility indicators and activity-travel behavior information of the residents.

Table 4: Sample characteristics

	Percentage
Mean age of respondents	45
Gender:	
Male	48.4
Female	51.6
Income:	
1000 euro or less	1.5
1001-2000 euro	17.5
2001-3000 euro	25.6
3001-4000 euro	29.2
4000 euro or more	26.2
Education level:	
Primary school	0.1
LTS, household school	1
MTS, MEAO, MAVO,MULO	12.3
HAVO, BWO, HBS	12.3
Bachelors, Masters	74.2
Working hours per week:	
Male	36.31
Female	28.02
Mean	31.86
Household type:	
Single person household	22.1
Couple with children <13 years	30.2
Couple without children	47.7

RESULTS

Descriptive results

Table 5 gives the numbers of participation in various SR activities. The figures indicate the most frequently performed is social (by 33.86%) of the sample, whereas Cultural and Sports are the least frequent activity (each by approximately 19% of the sample). Shopping activity is performed by 27.58% of the sample. With respect to company during activities, we find that, logically, social activities are in majority performed with other. Of this household members seem to be the most important category, whereas colleagues are least preferred for joint social and recreational

activities. Obviously people tend to perform social activities with household/family members and friends. Interestingly, people tend to shop alone and preference of shopping company do not include friends and family members. It is to be noted that daily grocery shopping is not included here (Table 5). Cultural activities are mostly carried out with household members, friends and colleagues. For sports and recreation activities colleagues are not favoured, and surprisingly, neither are family members.

Table 5: Activity engagement and company

	Social	Shopping	Sports and recreation	Cultural
% participation	33.86	27.58	19.55	19
Company				
- single	7.51	54.76	28.46	6.69
- household member	47.42	37.75	34.15	45.19
- family members	21.36	4.32	4.07	5.44
- friend/acquaintance	18.31	2.88	28.46	25.94
- colleague	5.40	0.29	4.88	16.74

Modelling results

In this section we will describe the main estimation results. We will refer to Table 6 for the results of the binary logistic regression model, and to Table 7 for the results of the multinomial logistic regression model. The results of both models will, however, be discussed by activity type.

Social activities

According to the binary logit model, company choice for social activities is influenced by various spatial variables. The probability of joint activity engagement increases if more service facilities, and more employment in hotels/restaurants/bars is accessibly in 20 minutes by car. A potential explanation is that restaurants/bars are places that are visited in the company of others. Greater accessibility of such facilities makes it more likely that social activities are aimed at visiting restaurants/bars and thus involve other people. The same may hold for certain services such as wellness etc. The significance of accessibility by car in 20 minutes suggests that distance also plays a role, to the extent that for social activities on larger distance, one is, apparently, more likely to seek company. This effect is mirrored in the effect of accessibility to workers in restaurants/bars and services by slow mode, which is negative. Apparently, if relevant facilities are found on shorter distance, this increases the probability of joint engagement. With respect to socio-demographics, we find that people with lower incomes (1000-2000 Euro) are more likely to participate in social

activities jointly. Finally, individuals living in row houses or apartments, are found to be less likely to engage in social activities in company of others.

Turning to the multinomial logistic regression model, we get comparable but slightly different outcomes. First, we find that access to services within 20 minutes by car still has a significant influence, but only for the company of family. In other words, jointly visiting services facilities for social purposes is mostly done with family or household members, not with friends/colleagues. A potential explanation is that joint social activities are the outcome of serve passenger trips, which is emergent for destinations on longer distance and usually coordinated on the household level. In addition, access to floor space of daily shopping facilities on walking distance now has a positive effect choosing the company of both family/household members and friends/colleagues. Thus, whereas close access to restaurants and services lead to more solo activity engagement, close access to shops leads to more joint activity engagement. An explanation for this is not readily available.

In terms of socio-demographics, we find again that people living in row houses are less likely to engage in joint social activity engagement (irrespective the company type). We further find that singles are less likely to engage in social activities with household members/family for obvious reasons. People with a car are more likely to engage in social activities with household members/family and also (although marginally significant) with friends/colleagues. Apparently, pooling resources is closely associated with joint activity engagement.

Shopping

The binary logistic model suggests that better accessibility of non-daily shopping facilities, both by foot and car, has a positive effect on joint shopping. Given that non-daily shopping often has, at least partly, a non-instrumental aspect (fun shopping), this suggests that with better accessibility, non-daily shopping facilities are more likely to be used for social interaction while shopping, leading to more joint shopping activities. Also, higher accessibility figures are likely to be associated with higher concentrations of non-daily shopping facilities, which go together with a wider range of food and beverage and entertainment facilities, which make them attractive for social interaction. In support of this, marginally significant positive effects on joint shopping are found for accessibility of workers in services, restaurants/bars and overall workers.

With respect to socio-demographics, we find that the probability of joint shopping (vs. Solo) decreases with number of work hours. This may be a time competition effect, in the sense that joint shopping requires more coordination than solo shopping, which is more difficult to achieve for workers. Also, joint shopping can be expected to take more time, due to the involved social interaction (e.g. drinking coffee etc.), which is harder to find for workers. Finally, workers may combine shopping with their

commute trip, again reducing the probability of joint shopping. With respect to age, we find that older participants are more likely to do their shopping jointly. Women turn out to be more likely to do their shopping jointly.

With respect to income, we find that low income people are more likely to go joint shopping, whereas high income groups are less likely to do so. Note that this effect cannot be attributed to working hours or car availability, since these effects were tested separately. A potential explanation is that pooling resources, such as ridesharing, saves money, which is more important for low income people.

Also, we find that people with children are more likely to do their shopping jointly, which can be explained from the availability of company. People without a car are less likely to do their shopping jointly. One might explain this from the fact that they are not able to offer transport to others, leading to fewer joint shopping episodes. Apparently, this is not offset by being chauffeured by others to joint shopping activities. Finally, individuals living in row or semidetached houses are less likely to do their shopping jointly.

Somewhat surprisingly, in the multinomial model only few variables turn out to have a significant effect. High educated individuals are less likely to go shopping with family and (marginally significant) friends/colleagues. This may be the same effect found in the binary model for income. Further, single people are less likely to shop jointly with household members/family but more likely (although marginally significant) to shop with friends and colleagues. This is as expected given the unavailability of household members to shop with.

In the multinomial model, no spatial variables turn out to have a significant effect. A potential explanation might be that spatial setting is correlated with household composition (being single or not), which has a diverse effect in the multinomial model, which cannot be represented in the binary model and is therefore suppressed.

Sports and recreation

The binary logistic model suggests that one is more likely to engage jointly in sports/recreation if accessibility to non-daily shops (by foot and car), railway stations (by foot) is higher, and one is less likely to do so if accessibility to workers in restaurants/bars (by foot and car) and culture (by car) is higher. Since accessibility to sports facilities was not available, we may take the other variables as proxies. It may be assumed that accessibility to restaurants/bars and cultural facilities is negatively correlated with accessibility to sports and recreation facilities. The outcomes would then suggest that if accessibility to sports and recreation facilities is better, the probabilities of joint engagement increase. Probably, lower accessibility of facilities makes it more difficult to coordinate joint engagement leading to more solo

engagement. Accessibility to railway stations may have a positive effect since they may serve as starting points for joint recreational trips.

With respect to socio-demographics, dual income household are less likely to sport/recreate jointly, possibly due to more difficulties in coordination. For the same reason, having children at home may lead to less joint engagement in sport/recreation. Regarding education we find that people with only primary education are more likely to engage in joint sports/recreation. Individuals with children are more likely to engage in sports/recreation activities jointly for obvious reasons. House owners are less likely to engage in joint recreation.

The multinomial model leads to various additional insights. First, the negative effect of accessibility to culture is here only seen for engagement in sports/recreation with colleagues. This supports our argument that lower access to sports/recreation facilities (correlated with better access to culture) makes coordination more difficult, which holds especially for friends/colleagues.

The positive effect on joint activity engagement of access to a station is seen here also for friends and colleagues, but has a negative effect for household members/family. Apparently, the positive effect of facilitating joint trips for recreational purposes, is limited to friends/colleagues and there appears to be competition between various companies.

Again, we see a strong effect of household composition, with singles being more likely to choose the company of friends than of family/household members, which is lost in the binary model.

Cultural

The binary model indicates that individuals are more likely to go to cultural activities jointly if accessibility to services and both daily and non-daily shopping facilities by foot is better. The effect of these variables is not readily evident and requires more study. Access to cultural facilities and bars/restaurants (by foot) adds to solo engagement in cultural activities. One explanation is that close access prevents the necessity to pool resources for transport and allowing one to act more independently. Also, better accessibility allows for easier implementation of impulsive activities, which may be more likely to be solo. In terms of socio-demographic we find that men are more likely to engage in cultural activities jointly. Having children decreases the probability of joint engagement, due to constraints set to joint activities by spouses due to child care obligations. Middle income groups and house owners are more likely to engage in cultural activities jointly. People with a car are more likely to jointly engage in cultural activities, probably due to their ability to provide transport to others, also leading to joint cultural activities.

The multinomial model confirms the negative effect of access to cultural facilities on joint engagement, but it turns out that this effect is limited to the company of household members and friends. Thus, the trade-off between solo and joint engagement in cultural activities seems to be with respect to joint engagement with family/household members. With respect to car ownership, a different effect is changed. It is found now that people from two-car households are less likely to engage jointly in cultural activities. Thus whereas a single car leads to pooling resources (e.g. at the household level) and joint engagement, having two cars allows for more independence and more solo engagement in cultural activities.

CONCLUSIONS

In this paper, we have investigated the effect of spatial characteristics on choice of company for various social and recreational activities. We feel that gaining more insight in individuals' choice of company will lead to an improved insight into their decisions regarding their activities and travel for social and recreational purposes. For instance, their choice of company, combined with the spatial characteristics of their social network, will determine to a large extent where social/recreational activities take place, with clear implications for travel behaviours. Specific emphasis was given to the implications of spatial setting on company choice. The underlying idea here is that spatial location of facilities for social interaction together with social network composition and factors such as household composition will determine which activities are undertaken solo or jointly and with whom.

In this paper we have investigated the effect of spatial setting on company choice for social activities, non-daily shopping, sports/recreation and cultural activities, using an existing Dutch data set from 2007. This data set contains two-day activity travel data, in which for each activity, the company was recorded. Binary and multinomial logistic regression models were estimated to test the impact of spatial and socio-demographic variables on company choice. The results suggest that accessibility of facilities has an impact on company choice. However, the mechanisms seem to differ between activity types. For social activities, shopping and sports/recreation, it seems that better access to facilities leads to more joint activity participation, presumably because coordination between involved parties in time and space becomes easier. In the case of sports/recreation, however, the evidence is indirect. In other cases (social and cultural activities), close access to facilities seems to lead to a higher probability of single activity engagement, possibly since impulsive activities (usually single) are easier to implement and pooling of facilities is not necessary. In addition to spatial variables, socio-demographics such as household composition, dual income and car ownership affect the choice between solo and joint in intuitively plausible ways.

An added value of the paper is that company choice is extended to include multiple types of company. Multinomial logistic regression models estimated for this purpose

suggest that spatial and socio-demographic variables may have different effects on different types of activities. For instance, the effect of access to services only has a positive effect on doing social activities with family/household members. For sports/recreation, vicinity of a railway station has a negative effect on joint activity participation with family, whereas it has a positive effect on joint activities with friends, suggesting competition between various types of company. Another insight is that socio-demographic variables may have different effects on different types of company. For instance, being single has (for shopping and sports/recreation), a positive effect of choosing the company of friends and a negative effect on choosing family as company. In this respect, the effect of being single is more important than spatial variables, that show up in a binary model. This suggests that to gain valid insights into the impact of spatial variables on company choice, it is necessary to distinguish between different types of company.

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Table 6: Binary logistic regression results of activity performance joint vs. alone

Activity joint or not	**Social**	**Shopping**	**Sports and recreation**	**Cultural**
Intercept	-26.209	13.008	30.566	-24.069
Working_hrs		-.028		
Age		.024	-.009**	
Work_Hotel_Slow		.002	-.004	-.003
Work_Culture_Slow	-.008*			-.008
Work_Service_Slow		.000		.002*
Work_Hotel_Car	.001**		-.003	
Work_Culture_Car			-.008	
Work_Total_Near		.000		
Work_Total_Far			.000	
Service_Slow	-.309*			
DShop_Slow		-.288		
Rail_Slow			.003	
FS_NDShop_Car		.000		
Culture_Car		-.225		
Service_Car	.643**		1.509	
NDShop_Car		.564*	2.356	
[Gender=0]		.664		-.469
[Dual_income_HH=0]			.846	
[Children_at_home=0]			.387	.747
[Education level primary=0]			-15.659	
[Income <= 1000 =0]		-1.628		
[Income1000-2000 =0]	-.719			
[Income2000-3000=0]				.990
[Income3000-4000=0]		.720		.952*
[Without_child=0]		-.862	-.630	
[own_house=0]			.635	-.893
[zero_car=0]		2.205**		
[one_car=0]				-1.819
[Semi_detached=0]		1.113		
[Row_house=0]	.998	1.673**		
[Apartment=0]	.814			

The reference category is= activity conducted alone
* = significance level <.005
**=significance level <.01
Others = significance level >.01 but <.10

Table 7: Multinomial (stepwise) logistic regression results of activity company

7.1 Social activities

social activity partners		**B**	**Std. Error**
family	Intercept	-2.021	1.752
	FS_DShop_Car	.000	.000
	FS_DShop_Slow	.000	.000
	Service_Car	1.301	.624
	[Single=0]	4.628*	1.476
	[one_car=0]	-3.949*	1.313
	[Row_house=0]	3.544*	1.033
friends and colleagues	Intercept	-.271	1.667
	FS_DShop_Car	.000	.000
	FS_DShop_Slow	.000	.000
	Service_Car	.754	.616
	[Single=0]	1.668	1.423
	[one_car=0]	-2.148	1.278
	[Row_house=0]	1.317	.978

The reference category is= social activity conducted alone
* = significance level <.005
**=significance level <.01
Others = significance level >.01 but <.10

7.2 Shopping activities

shopping activity partners		**B**	**Std. Error**
family	Intercept	-1.113**	.414
	[Graduates=0]	.952	.385
	[Single=0]	1.122**	.437
friends and colleagues	Intercept	-2.103*	.638
	[Graduates=0]	1.428	.835
	[Single=0]	-1.347	.814

The reference category is= shopping activity conducted alone
* = significance level <.005
**=significance level <.01
Others = significance level >.01 but <.10

7.3 Sports and Recreational activities

sports and recreation activity partners		**B**	**Std. Error**
family	Intercept	-3.481**	1.323
	Rail_Car	-.028	.314
	FS_DShop_Slow	.000*	.000
	Work_Culture_Slow	-.021*	.007
	[Single=0]	2.170	.869
	Work_Culture_Car	.000	.001
	Rail_Slow	.075	.091
friends and colleagues	Intercept	.327	1.034
	Rail_Car	.754	.302
	FS_DShop_Slow	.000	.000
	Work_Culture_Slow	-.015	.006
	[Single=0]	-.677	.628
	Work_Culture_Car	-.002	.001
	Rail_Slow	-.191	.091

The reference category is= sports and recreational activity conducted alone
* = significance level <.005
**=significance level <.01
Others = significance level >.01 but <.10

7.4 Cultural activities

cultural activity partners		**B**	**Std. Error**
family	Intercept	16.233*	1.237
	Work_Culture_Slow	-.018*	.006
	[Other=0]	-15.044*	1.130
	[two_cars=0]	2.411	.985
	[Without_child=0]	15.502	2179.904
friends and colleagues	Intercept	17.385*	.634
	Work_Culture_Slow	-.007	.006
	[Other=0]	-17.141	.000
	[two_cars=0]	1.175	1.040
	[Without_child=0]	18.410	2179.904

The reference category is= cultural activity conducted alone
* = significance level <.005
**=significance level <.01
Others = significance level >.01 but <.10