Mass effects and mobility decisions

Maya Abou-Zeid, Jan-Dirk Schmöcker, Prawira Fajarindra Belgiawan, Satoshi Fujii

This presentation reviews the literature on mass effects and their importance in choice behavior, i.e. how individual behavior is influenced by the behavior of others, with the goal of extracting lessons for transportation policy. An overview of psychological theories explaining the process underlying mass effects and conformity behavior is given. This is followed by a presentation of evidence of mass effects on choice behavior both outside and within transportation planning, covering contexts ranging from long term choices such as residential location to short term decisions such as driving behavior. Based on this review, modeling approaches for studying mass effects and their data requirements are then synthesized, highlighting the advantages and limitations of each. The presentation concludes with a discussion of the importance of leveraging the power of mass effects for designing transportation policies aiming at promoting sustainable and safe mobility, and of challenges for future work in this area.

Sociodynamic discrete choice: equilibrium behavior of the nested logit model with social interactions

Elenna Dugundji

Suppose you have the possibility to choose to adopt one of a number of discrete behaviors or to choose to buy one of a number of different products. Moreover, suppose the choice is multidimensional or more generally, that there are common unobserved attributes of the choice alternatives. A classic approach to statistical prediction in such a situation given an observed sample of decisionmaking agents in a population is the nested logit model (Ben-Akiva 1973, McFadden 1978).
Now suppose your choice to adopt a discrete behavior or buy a discrete product is influenced by what choices your neighbors and/or members of your social network make, or by your personal general perception of percentages of segments of the population making these choices. Brock and Durlauf (2006) have proposed such a variant of the nested logit model, noting that, “There has yet to be any analysis of [such] models ... when self-consistency is imposed on the expected group choice percentages.
Such an analysis should provide a number of interesting results.” This paper aims to fill this gap. The past two decades have seen noteworthy examples of concepts from statistical physics applied to further the understanding of complex socio-economic systems, particularly with respect to non-market interactions in the sense of conventions, network externalities, neighborhood or group effects, or interactive agents. My starting point in considering interdependence of various decision-makers’ choices is a series of papers by economists Aoki (1995), Brock and Durlauf (2001, 2002, 2006), Blume (2003) and Blume and Durlauf (2003). They introduce social interactions in binary and multinomial logit choice models by allowing a given decision-maker’s choice for a particular alternative to be dependent on the overall share of decision-makers that choose that alternative. Such a specification is interesting because of the above-described inherent dynamic that could arise if the choice model were to be applied repeatedly in successive time steps with the shares of decision-makers continuously updated as a result of the choice in the previous time step. The specification namely captures feedback between decision-makers that can potentially be reinforcing over the course of time depending on parameters. In diverse literature
this socio-dynamically reinforcing behavior is referred to as a social multiplier, a cascade, a bandwagon effect, imitation, contagion, herd behavior, etc (Manski, 1995). This paper makes Brock and Durlauf’s multinomial choice model of neighborhood effects precise for the case of trinary multinomial choice and extends the results for the case of trinary nested logit. The analysis for the sociodynamic multinomial logit model reveals a previously unnoticed hysteresis regime in midrange parameter space when there are more than two choice alternatives. The sociodynamic nested logit analysis further yields rich bifurcation diagrams with several major

additional new steady-state regimes where symmetry is broken by the scale parameter for the level of correlation between alternatives. An empirical application of the sociodynamic nested logit model to transportation mode choice shows that estimated parameters fall into one of these new regimes.

Space, time, and social support dynamics in personal networks
Juan Antonio Carrasco

Empirical recent research on the role of social networks in travel behavior has highlighted the importance of knowing the spatial and frequency of interaction patterns in social contacts to better assess the mobility characteristics for social activities. In addition, recent research on the spatiality of social support has highlighted the possible links between social capital and mobility. Data to study these issues comes from personal networks gathered in different urban contexts, which draw from methods that are gaining maturity in the transport research community. However, we still know very little about the dynamics of the spatial, temporal, and social support in relation with mobility.The objective of this paper is to study the change in time of personal networks on these three dimensions, exploring the key sociodemographic, social network and urban context aspects that may influence these dynamics. Panel data from 110 personal networks collected in 2008 and 2012 is used to study these aspects through statistical multivariate models.

The relationships between social networks, activity patterns, and driving behavior
Yoram Shiftan and Wafa Elias

To date there has been some research on the impact of social interaction on activity patterns and travel behavior, and to a lesser degree also on the impact of social interaction of driving behavior. Wafa et al (2010) found that activity pattern and travel behavior do have an effect on driving behavior and crash involvement. This paper expends this idea by adding the social interaction factor and how it impacts both travel patterns and driving behavior and risk exposure. It focuses on the multi-way complex relationships between socio-demographic characteristics, social interactions, activity participation and travel patterns, and driving behavior using structural equation approach.
The study is based on a unique data set currently being collected as part of a larger study on the factors affecting the high rates of the Israeli Arab population involvement in inter-city road crashes. The study includes an initial telephone survey of 600 respondents, of which hundred respondents will be asked to participate in a more detail face to face survey. The telephone survey will, among other purposes, identify violators' drivers and will ensure sufficient violators' driving participants among the 100 participants in the face to face survey. The participants in the face to face survey will be asked to carry a GPS for a period of couple of weeks. At the end of this period an interview will be conducted where questions seeking further details on the travel patterns identified by the GPS will be asked including the purpose of each trip and with whom was it made, in addition to various questions about driving behavior, driving violation and crash involvement, social interaction at different circles (close family within the household, relatives, friends, and work colleagues) and various attitudinal questions.
Social interactions questions will try to identify personal networks by asking about relationships with close family (parents, children, and siblings), relatives (cousins and other), friends and work colleagues. Questions will identify frequency of visits and other communication (phone, email) and type of relationships (attitude/support) as well as social norms within these circles. The survey will focus on one village in the Galilee Region in Northern Israel so it is expected that various respondents will be both *egos,* those the survey is concentrate on and *alters,* those who have relationships with them (Carrasco and Miller, 2009), so we could analyze the impacts of various types of alters and their social network on egos.

It is expected that better understanding of the social structure and daily life will improve our understanding of driving behavior, which can guide policy makers to direct efforts in improving driving behavior to specific populations with specific characteristics, and identify the importance of social norms and interactions.

Information diffusion by motorbikes and mobile phones in rural Indonesia

Petr Matous, Yasuyuki Todo, Ayu Pratiwi

This paper explores the interplay of private transport and new information-communication technologies in diffusion of agricultural information across rural Indonesia. In 2012, we elicited communication partners of 315 farmers in 15 randomly selected coffee and cocoa producing communities across Tangamus district on Sumatra Island. 80% of the respondents owned a motorbike, 76% owned a mobile phone, and 70% owned both. Phone owners had geographically more extensive information networks than those without a phone. In particular, farmers who had purchased a phone despite not having a motorbike had their communication partners located further away (mean 2.8km) than those who could afford a motorbike but did not invest in a phone (1km). The difference among phone owners and the rest persists even when controlling for the farmers' SES and their migration history. However, mobile phones are not necessarily utilized for learning from distant sources. The respondents used almost exclusively three ways of contacting others: (1) walking to their house or office; (2) going there by a motorbike; and (3) calling them by a mobile phone. Walking was the main mode of contact for 1068 relationships and riding a motorbike for 453 relationships. In contrast, calling information providers by a mobile phone was the main mode of contact only for 47 elicited information-sharing relationships. 25% percent of the information-sharing relationships stretched over more than 10km. Even at such distances, walking was as common as riding a motorbike, while phones are rarely used (44%,45%, and 10% for relationships over 10km respectively). To identify which factors, in addition to geographical distance, affect the choice of the mode of contact, we conducted a multi-level (village-, individual-, and relationship-level) multinomial logistic regression on the sub-sample of respondents who own both phones and motorbikes. Controlling for distance, preliminary results suggest that walking is particularly preferred for contacting relatives, while riding a motorbike is relatively more common for contacting officials from public institutions. Regardless their wealth, more geographically remote and more educated farmers walk less. Less educated farmers prefer most gathering information through face-to-face meetings instead of calling. Although new information-communication technologies have spread rapidly to the remote corners of the developing world, personal physical mobility and transportation infrastructure still play an indispensable role in accessing information and social learning.

Modelling information & learning in agent-based models of activity/travel: issues & options

Eric Miller

Agent-based microsimulation models provide a computational framework for tracking information acquisition, learning and the evolution of activity/travel behaviour by individual agents over time. Information acquisition can occur via many "channels", including: direct experience/observation, communications media (newspapers, radio, TV, social media, etc.) and social networks (information exchanges with friends, relatives, co-workers, neighbours, etc.). While models of both learning and social influence are evolving areas of research it is fair to say that many obstacles currently exist with respect of incorporating these concepts in operational, large-scale models of activity/travel that are useful for practical planning and policy analysis purposes.
Given this, the objectives of this paper are:

1. Critically and succinctly review the current state of the art in activity/travel behavioural analysis and modeling with respect to information acquisition, social influence and learning.
2. Enumerate and discuss the maior challenges currently facing practical incorporation of learning dynamics in operational activity/travel models.
3. Suggest a research program for developing improved, practical models.

Modelling challenges that are discussed in the paper include:

- The characterization of "information" in operational models.
- Representation of information channels (experience, media, social networks).
- Characterisation of learning processes.
- Problems associated with observing/modeling individuals at arbitrary points in their life-course.
- Data requirements.
- Model estimation issues.
- Computational issues.

Validation of a household joint activity-travel multi-agent simulation tool

Thibaut Dubernet & Kay W. Axhausen

An important part of trips is due to, or influenced by social interactions. This is particularly true for leisure trips, for which individuals are likely to favour destinations to places where they can share time with social contacts.
Travel behaviour simulation tools are useful for policy evaluation or behavioural hypothesis testing.
However, in a wide majority of the software solutions available on the market, individuals are considered to interact only via congestion. Moreover, such softwares still have difficulties to predict leisure travel accurately.
It is hypothesised that including social contacts (households or more general social networks) in a simulation framework would allow finer predictions of the distance distributions for leisure travel. The work outlined here aims at including social interactions in an existing activity-based travel simulation platform, MATSim, focusing on the simple — but crucial — case of intra-households interactions.
The paper and presentation will present the general framework designed to correlate the choice of daily plans by agents, along with results for the Zürich area, Switzerland. The results will be compared to the results without intra-household interaction, and the impact on the exactitude of the distance distribution and vehicle occupancy forecasts will be discussed, and ways to improve the model will be outlined.

A micro-simulation of population-wide social network dynamics using utility-based friendship formation model

Theo Arentze, Fariya Sharmeen, Harry Timmermans

Analysis of social travel and social interaction patterns has been an important part of transportation research in recent years. The reason is the rising share of leisure travel all over the world and the recognition that key decisions of leisure travel are associated with the social (leisure) networks of individuals. In an attempt to contribute to the analysis of travel behavior from a long term lifecycle perspective, we focus on the dynamics of personal social networks in this study. We extend and apply a utility based friendship formation model to simulate for the first time the dynamics of a population-wide social network for the Netherlands, where life-cycle events are considered as trigger of social network dynamics.
Two datasets are used to generate the population-wide dynamic social network. The first data set is from a national travel survey (MON) of Netherlands collected by the Central Bureau of

Statistics from 2004 to 2009. It is a large sample (in 2009, approximately 30,000 individuals) representative of the Dutch population. The second dataset was collected in 2011 among 638 respondents to obtain information about the dynamics of personal social networks. A web-based questionnaire was designed for an event-based retrospective survey where information was collected about changes in social networks of persons due to major life-cycle events (viz. residential relocation, getting married/divorced/cohabitation, children starting school, starting new job and starting University). The respondents were selected randomly from The Netherlands, who had undergone any of the stated events in recent years. The questionnaire collected information about ego-alter tie characteristics before and after the event. The first dataset is used to obtain a complementary sample of the population required to generate a population-wide social network. The second dataset provides the key information to estimate a friendship model that allows us to predict probabilities of ego-alter tie dynamics.
The utility based friendship formation model developed in Arentze et al. [1, 2] is extended to incorporate influence of events on the duration of friendship links. The model defines the utility of a link as a function of homophily, geographical distance, existence of common friends and opportunities to form relationships. The model assumes that a link between two random persons exists when the utility exceeds a threshold value for both persons. Further using the estimations of the second data set the dynamics of those links are simulated.
The study provides a method for micro-simulation of social network dynamics. The method and findings will contribute not only to long-term travel behavior analysis and prediction but also to human social behavior in a more general sense.

Public transport as catalyst of social interactions: how it works in low-density environment?

Hitomi Nakanishi, Cameron Gordon, and Richard Nash

This research focuses on the social benefits of public transport in low-density environment. People in low-density population need to rely on automobile transport more than people in high-density development areas with transit. In low-density environment people have lower mobility; groups such as the elderly, children, and disabled are vulnerable to social exclusion due to the limited transport options to engage with people and activities. This is a common concern in mid-small size cities that are not purely rural areas. These cities may suffering from social exclusion and deprivation partly caused by the dispersed development patterns and high dependence on automobile transport. Our research questions are: how does public transport induce social interactions? How do such transit induced social interactions contribute to building of social capital? What is the role of public transport in the context of building social capital generally and more particularly as compared to less collective mode of automobile travel? How do these factors affect quality of life?
This paper explores these questions by examining Canberra, a low-density environment in Australia. A residents questionnaire survey 'quality of life in your city and living environment' was conducted during May-Aug 2012. The questionnaire survey consisted of three sections – 1) perceptions about neighbourhood and environment, 2) value (priority in quality of life), and 3) personal information including travel behaviour. Section one includes questions about community safety, community well-being as indicators of social capital, and satisfaction with public transport service. Based on the obtained data, authors estimate the level of social capital, and quality of life by neighbourhood applying a Quality of Life (QoL) model. By integrating the bus passengers OD data to the analysis, the authors explore how the use of public transport is connected with trips to and from places of social significance and further explore how this relates to social capital and quality of life. As Canberra is going to introduce a newly configured public transport system, we simulate the influence of a new transport system (likely to be light rail) on social interaction and quality of life.
This research has policy implications for local government and public transport providers. This research provides an insightful discussion-base of social benefits of public transport and how it

will contribute to enhanced social capital, an important input into quality of life, which is one consequence of sustainability. An example in Canberra can be generalised to the case of similar cities in the world and give hints for authorities in reconsidering the socio-economic benefits of public transport.

No car - no job? Interaction between mobility and professional activities of people in rural areas

Wiebke Unbehaun & Tina Uhlmann

Surveys that consider career chances of women mainly discuss the availability of child care facilities, jobs and qualification measures, but almost no study observe the interaction between household members e.g. the allocation of tasks within families, the availability and quality of transport modes and employment. Although, access to mobility is one mayor precondition to ensure a fair share of participation in all areas of life connected with employment and family. Especially people in rural areas who are responsible for care of family members and household - mainly women - are affected by disadvantages: they have complex trip chains and a restricted time budget. In rural areas job and infrastructure density is low, people have to cover long distances and public transport supply is mostly insufficient. In Austria this leads to traditional distribution of care and household and makes it difficult for these persons to (re-)enter working life and proceed in career.The paper follows the question how the distribution of responsibilities in households and mobility access affect the chances of fair participation in employment of women and men in Austrian rural areas. A survey will be described applying a combination of qualitative and quantitative methods which was implemented in a test side in Lower Austria in close cooperation with local stakeholders. Within quantitative interviews following an extended KONTIV design inhabitants of the region were asked about their travel behaviour, mobility needs and barriers, employment prospective, allocation of tasks within the family and existing coping strategies. In in-depth interviews and focus groups these topics were taken up again and especially existing coping strategies and the role of social networks were discussed. Aim of the surveys is to identify obstacles within the gender and mobility system which hinder persons to be employed and to deduce gender specific needs concerning mobility offers besides private car use. The survey results provide information on the quantity of persons affected and give further hints on interactions between gender, mobility and professional activities in rural areas.

Mobility and the Potential for Contact in Income Stratified Toronto

Antonio Páez, Khandker M. Nurul Habib

An increasing income gap has been observed in many countries in the developed world. At the urban scale, there are indications of spatial income differentiation in many cities. In the case of Toronto, the largest and most influential city in Canada, an emerging concern is the geographical separation of population by in-come, a phenomenon dubbed the vanishing middle in media reports. A driving force behind this phenomenon is the pattern of development in the city, whereby expensive high-rise construction in the central, more accessible parts of the city have priced-out lower income residents, who trade-off commuting distance for affordable hous-ing. A potential outcome of this spatial sorting process is that the potential for contact between residents in different income classes can become rather limited, thus leading to segregation patterns and the risk of social exclusion. The objective of the present paper is to analyze the potential for contact in income stratified Toronto. Unlike traditional measures of population patterns that incorporate fixed definitions of space, in this study we adopt an individual mobility perspective. This allows us to investigate the potential for contact from the per-spective of specific income classes. Significance testing, based on the Gi statistic of spatial concentration can be deployed to identify hot-spots, areas where the potential for contact between members of

the same category (i.e. clustering) is greater than expected, and areas where the potential for contact between members of differ-ent categories (i.e. exposure) is greater than expected.

Social interaction in the neighbourhood: a multilevel analysis
Pauline van den Berg, Theo Arentze, Harry Timmermans

Social interactions among neighbours are a key indicator of the strength of local communities. The social network literature suggests that these communities are losing importance, as social networks are becoming more spatially spread as a result of the development of transportation and communication technology. On the other hand, in urban renewal policies in Western European countries great importance is attached to creating housing differentiation as way to improve social cohesion and solve problems of social exclusion through neighbourhood-based social interactions. However, as there is no strong empirical basis for these policies, it is important to improve our understanding of social interactions among neighbours, based on empirical results. This paper therefore analyses to what extent social interactions with neighbours are affected by neighbourhood characteristics as well as personal and mobility attributes. The analyses are based on data collected in 2008 in a number of neighbourhoods in and around Eindhoven, the Netherlands among 747 respondents. The data collection instrument consists of a two-day social interaction diary which was used to gather detailed information about the respondents' interactions and the persons they contacted. Using these data a binomial model is estimated analysing whether or not a social interaction took place with someone from the neighbourhood. As the data have a hierarchical clustered structure (several social interactions belong to the same respondents) multilevel analysis is used. The paper presents the results of the analysis and discusses the implications of the findings for urban planning policy.

Accommodating spatial dependence in multivariate discrete choice models: a new approach with applications to crash analysis and land-use modeling
Chandra Bhat

This paper proposes a new spatial multivariate model to predict the count of new businesses at a county level in the State of Texas. Several important factors including agglomeration economies/diseconomies, industrial specialization indices, human capital, fiscal conditions, transportation infrastructure and land development characteristics are considered. The results highlight the need to use a multivariate modelling system for the analysis of business counts by sector type, while also accommodating spatial dependence effects in business counts.

Using negotiation protocols to model joint decision making for scheduling social activities and travel: review and empirical evidence
Theo A. Arentze

Individuals often make activity and travel choices in a social setting. This is particularly apparent in cases where two or more persons plan a joint activity for example for leisure or purely social purpose. To schedule a joint activity, the persons involved need to make joint decisions about choice facets such as the duration, timing and location of the activity and transport mode for the trip.
Choice behaviour in the context of joint activities has received continuous attention in travel behaviour research. Proposed approaches to model this choice behavior typically focus on within-household interactions and assume that individuals involved maximize a group-level utility. In recent work, Ma, Arentze and Timmermans (2012) and Ronald, Arentze and Timmermans (2012) proposed negotiation protocols in semi-cooperative settings as an alternative framework to model these processes. This framework offers a way to go beyond the

household context and include the persons' broader social network. Furthermore, it offers a way to accommodate factors, such as trust, reciprocity and social justice, which generally play an important role in semi-cooperative settings, as experimental psychological and economic research have shown.
The negotiation-protocol approach to modelling joint activity scheduling is promising but still in an early phase of development. This paper provides a review of this field of research and presents a formal model that integrates various concepts (credit, power, altruism, concession strategies) that have been put forward in this literature. Furthermore, the paper presents the results of an (on-line) experiment that is conducted to test basic concepts and estimate parameters in this framework. Finally, the paper discusses the potential of this new approach for travel-demand modelling and proposes an agenda for future research.

Incorporating Social aspects in a prospect theory model of travel behavior
Erel Avineri

A cognitive modeling approach that has attracted relatively high level of interest among travel behavior researchers is prospect theory (PT, Kahneman and Tversky, 1979; Tversky & Kahneman, 1992). Through a series of experiments, Tversky and Kahneman found strong evidence of systematic deviations from normative models of risky choice making. This has led them to the development of a descriptive model of choice making, which captured the observed behavior of individuals in settings that involve risky choices. As many of the behavioral assumptions and paradigms applied in travel behavior modeling have emerged from the normative models are challenged by the descriptive model of PT, it is not surprising that transport researchers where interested to revisit these assumptions and explore the potential of PT in providing alternative explanation of travel choices. As travel alternatives carry both positive and negative components of utilities and values, their attributes can be framed as 'gains' or 'losses', making the concept of reference-dependent preferences and loss aversion relevant to travel choices. The result is a growing body of recent studies that apply PT to model a variety of travel choice-dimensions (e.g. Avineri and Prashker, 2004; Viti et al., 2005; Gao et al., 2010, Senbil and Kitamura, 2004; Jou et al., 2008). There have been several attempts to further apply PT to improve network equilibrium models, substitute for decision rules, and examine the effect of the reference point value on such equilibrium (e.g. Avineri, 2006; Connors and Sumalee, 2009; Tian et al., forthcoming). However most of the work in this field assumes homogeny among travellers, thus all travellers share the same behavior patterns under risk and uncertainty. This ignores social aspects of travel behavior, which are commonly omitted from the formal modeling process. There is growing interest in the study of social influence in the context of travel (for example, Arentze and Timmermans, 2008). However, so far there has been only little application of socio-psychological aspects of choice behavior in other types of travel behavior models (such as equilibrium models). This paper introduces a theoretical framework that incorporates social learning and social imitation models in a prospect-theory model of travel choice and examine the potential role of dynamic reference points in predicting (and influencing) travel choices, and the emergence of strategic behaviors such as confirmation (reinforcing behavior if other group members have similar behavior) and conformity (following the majority choice in the group).

Integrating discrete choice modeling with social interactions to examine how travellers react to uncertainty caused by extreme weather conditions
Tim Ryley

This paper reports on the results of an experimental survey on the way long-distance travellers react to weather-related uncertainty. This survey has been developed in line with recent advances in both economic choice theory and travel behaviour research, which considers that

an individual decision maker's social network is a relatively low-cost decision heuristic in uncertain conditions. An internet-based survey was conducted with over 2,000 respondents in the two United Kingdom cities of London and Glasgow between August 2011 and February 2012. The survey contained a social network analysis section, a stated preference experiment on long-distance travel, experience of travel under weather uncertainty, and environmental attitudes, as well as detailed personal/household demographics. This paper focuses on the stated preference experiment examining travel mode choice between London and Glasgow (with attributes describing departure time, access time, average travel time, cost, and probabilities of four different arrival times) under different extreme weather conditions. The experiment explored the impact of different forms of social dimension on individual choice in uncertain conditions employing the following questions (which were asked, in turn, after each choice task):1. Whether they considered (or not) what people in their social circle, as well as people similar to them (in terms of income, age and neighbourhood) would have done in a similar situation;2. To indicate what the majority of people similar to them would have done in a similar situation;3. What each of first five members of their social circle would have chosen in terms of transport method. Their degree of confidence in reporting this as well the potential to change their mind after having reflected about the preference of their network (plus confident, change mind); and 4. Whether they wanted to change their mind after seen the % of people in their neighbourhood selecting one or another option (these responses share were artificially constructed varying the current mode share for the London to Glasgow corridor). Also, the depth of the collected information, which includes a number of location (like post-code) and socio-demographic characteristics will enable us to look for social and spatial similarities across choice data. These findings will then be compared with those drawn from the direct post choice card questions. This workshop paper builds upon the survey design and social network analysis paper presented at the previous workshop. It will be in two parts. The first part will present choice model estimations of the SP data and the subsequent social interaction aspects. Preliminary results reveal the importance of social networks in affecting travel decisions in an uncertain context. Travellers do seem to rely on the advice of particular others when facing complex travel decisions, dependent on general travel experience of the given route, capability of providing emotional support and experience with the management of real time information. The second part will discuss the econometric framework to answer the following question: Can choice models effectively be extended to consider that individuals do not act in isolation but refer to others when making choices? It is anticipated that our econometric framework will explore the issues of spatial and social correlation among decision makers as well as multiple discrete choices. The issue of endogenity will also be discussed.

Analysis of eco-mobility shift considering with heterogeneity and social interaction

Masashi Okushima

Construction of the sustainable transportation system in environment is one of the important subjects of urban transport planning. Not only improvement of service level of modes such as public transport but also consciousness for environmental problem of individual trip maker is important for eco-mobility shift. Moreover, the consciousness for the environment problem would be changed by influence of the other people. Therefore, the social interaction should be described for estimation of carbon dioxide emission in the transport sector with transport policy for eco-commuting promotion. Furthermore, as it is considered that the heterogeneity of the commuters influence to social interaction, the heterogeneity on social interaction should be described in the modeling of the eco-mobility shift. Therefore, it is aimed the eco-mobility shift is modeled with the heterogeneity and social interaction for the evaluation of the economic incentive policies in the study. The change of travel behavior corresponding to the transport policy is regarded as the eco-mobility shift in the study. Therefore, the modal shift from private vehicle to other mode as well as the vehicle transaction to clean energy vehicle are considered

as the eco-mobility shift. The eco-consciousness and the travel behavior of the commuter in the local city of Japan are investigated by the questionnaire survey. The covariance structure about the eco-consciousness of the commuter is analyzed by structural equation modeling. As the result of estimation, it is confirmed that the individual eco-consciousness is a reasonable cause for the intention of self-sacrifice for the reduction of emission. And also, the relation of the perceived eco-consciousness of most familiar person and the individual eco-consciousness is statistically significant. The decision process of the eco-mobility shift corresponding to the transport policy is described with consciousness for environment problem. The factor related to the eco-mobility shift includes not only the consciousness for environment problem but also the influence of the social interaction. It is considered that the influence of social interaction to the eco-mobility shift is not same extent by the heterogeneity of the trip makers. The commuting modal shift and the vehicle transaction to clean energy vehicle corresponding to the transport policy is estimated with the multi-agent simulation. The eco-mobility shift is affected by the eco-consciousness and the social conformity effect as well as local interaction by specific familiar person in the model. The time series changes of the number of commuting modal shift and the vehicle transaction to clean energy vehicle are estimated by proposed multi-agent simulation. Finally, it can be founded the heterogeneity on social interaction should be described in the modeling of the eco-mobility shift.

Changing commutes? Exploring the uptake of cycling to work through an agent-based model focusing on social interactions and social norms

James Woodcock & Rachel Aldred

Cycling could bring a number of benefits, including reducing greenhouse gas emissions, while simultaneously improving population health and well-being. Cycle commuting is generally low in England but with substantial variation and increases in some areas. However, there is limited evidence on the effectiveness of interventions.
In this presentation we introduce the ESRC funded project “Changing Commutes?”. In this project we are using existing qualitative and quantitative datasets and workshops to develop an agent-based model exploring the potential for transitions towards more sustainable commuting. The model will focus on social influence, social values and social learning, and how these shape commuting practices over time in a heterogeneous population. Data from qualitative studies is being used to develop rules on how people interact with each other and their environments. We are using practice theory as the theoretical underpinning for behaviour. Practice theory explains social behaviours in terms of stuff, skills, and meanings, rather than a focus on planned behaviour or utility maximisation. We will investigate how behaviours might change as policies are implemented and habits disrupted and how change might spread or dissipate in a given context. The model will be parameterised for three English cities (Bristol, Cambridge and Chester) all of which have received investment in cycling but are starting from very different positions.

A social dimension to urban freight

Johan W. Joubert

Urban freight vehicle movement may only represent a small fraction of the total vehicle population, but their contribution to congestion and its environmental footprint is disproportionately large. As such, the field is often treated in isolation from people movement. The concepts of complex and social networks, and how people travel to socialise in their contact networks is a relatively new field in transportation. Even newer still is extending these "social" networks to firms, and how vehicle and goods movement result from the interactions among firms. The supply chain management body of knowledge takes a focussed view on a single firm, and establishes the relationships the firm has with upstream suppliers and downstream

distributors and customers. The "social" ties between firms may be the result of coincidental transactions, arm-length agreements, or formally structured contracts. When using complex networks, i.e. `social' networks to bridge the gap between the fields of transport planning and supply chain management, a number of valuable opportunities are unlocked that has implications for both policy makers, planners, and freight operators.

Automobile ownership, happiness and peer effects

Frank Goetzke & Tilmann Rave

Happiness research becomes increasingly popular in transportation research; however, this is, at least to our knowledge, the first study which uses a large national dataset to determine the impact of automobile access on quality of live. Based on German SOEP 2003 data and following the approach of Ferrer-i-Carbonell (2003), our analysis focused especially on the role peer effects of automobile availability play on subjective well-being. After defining peers based on age and education, we found that happiness decreases persons with access to a car the higher the peer's average automobile availability, but not visa versa (happiness does not increase for car owners the lower the peer's average automobile availability). Since this result shows that not having access to a car does not reduce quality of live as long as the peers are similarly deprived, it supports the idea that automobile availability increases happiness only as on option value (mobility as an option), not through the actual activity made possible by the automobile.