The role of intention as mediator between latent effects and behavior: application of a hybrid choice model to study departure time choices

An increasing number of papers are focusing on integrating psychological aspects into the typical discrete choice models. The majority of these studies account for several latent effects, but they mainly focused on the direct effect of attitudes, perception, and norms in the discrete choice. None of them consider the effect of intention and its role as mediator between those psychological effects and the choice, as implied in the Theory of Planned Behavior. In this paper we contribute to the literature in this field by specifically studying the direct effect of the intention on the actual behavior, while attitude, social norms, and perceived behavioral control affect the intention to behave in a given way. We apply a hybrid choice model to study the departure time choice. For this, we use data from Danish commuters in the morning rush hours in the Greater Copenhagen area. We find a significant effect of the intention to arrive at work on time on the departing time choice, and also a significant effect of the lower level mediators on intention. Furthermore, the attitude toward short travel time is also significant in explaining the departure time choice. Finally, in terms of forecasting, we find that individuals who have a strong intention to be at work on time will be less likely to reschedule their departure time. This suggests that campaigns targeting the working culture could affect the subject norms among colleagues, which in turn influence individuals’ intention to be on time or to reschedule to a less congested time slot.
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Corresponding author: Thorhauge, M.
Contributors: Thorhauge, M., Cherchi, E., Walker, J. L., Rich, J.
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A disaggregate freight transport chain choice model for Europe
This paper presents the estimation of a discrete freight transport chain choice model for Europe, which was developed for the European Union as part of the Transtools 3 project. The model describes nine different multi- and single mode chain alternatives of which three can be either container or non-containerised, and it segments freight into dry bulk, liquid bulk, containers and general cargo. The model was estimated on the basis of disaggregate data at the shipment level (Swedish CFS and French ECHO data). Several transport costs specifications and nesting structures were tested and elasticities compared with reference literature. It was found that freight models are characterised by heterogeneity, non-linearity in transport costs and hence Value of Times and non-constant rates of substitution. Not taking these elements into account will have consequences for the evaluation of transport policies using the freight transport model.

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Commuters’ attitudes and norms related to travel time and punctuality: A psychographic segmentation to reduce congestion
Congestion remains one of the most prevalent transport problems in big cities. As a starting point for more targeted interventions to reduce congestion, this paper suggests a segmentation of commuters. Based on psychographic factors derived from an expanded Theory of Planned Behaviour, we identify three distinct commuter segments: (1) Unhurried...
timely commuters, who find it very important to arrive on time but less important to have a short travel time; (2) Self-determined commuters, who find it less important to arrive on time and depend less on others for their transport choices; and (3) Busy commuters, who find it both important to arrive on time and to have a short travel time. Comparing the segments based on background variables shows that Self-determined commuters are younger and work more often on flextime, while Unhurried timely commuters have longer distances to work and commute more often by public transport. Results of a discrete departure time choice model, estimated based on data from a stated preference experiment, confirm the criterion validity of the segmentation. A scenario simulating a toll ring illustrates that mainly Self-determined commuters would change their departure time as a response to this economic intervention, while we suggest alternative interventions for the two other segments. The results stress the need for more targeted efforts to change departure time choice and point to ways to improve the suggested segmentation approach.

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D-efficient or deficient? A robustness analysis of stated choice experimental designs
This paper is motivated by the increasing popularity of efficient designs for stated choice experiments. The objective in efficient designs is to create a stated choice experiment that minimizes the standard errors of the estimated parameters. In order to do so, such designs require specifying prior values for the parameters to be estimated. While there is significant literature demonstrating the efficiency improvements (and cost savings) of employing efficient designs, the bulk of the literature tests conditions where the priors used to generate the efficient design are assumed to be accurate. However, there is substantially less literature that compares how different design types perform under varying degree of error of the prior. The literature that does exist assumes small fractions are used (e.g., under 20 unique choice tasks generated), which is in contrast to computer-aided surveys that readily allow for large fractions. Further, the results in the literature are abstract in that there is no reference point (i.e., meaningful units) to provide clear insight on the magnitude of any issue. Our objective is to analyze the robustness of different designs within a typical stated choice experiment context of a trade-off between price and quality. We use as an example transportation mode choice, where the key parameter to estimate is the value of time (VOT). Within this context, we test many designs to examine how robust efficient designs are against a misspecification of the prior parameters. The simple mode choice setting allows for insightful visualizations of the designs themselves and also an interpretable reference point (VOT) for the range in which each design is robust. Not surprisingly, the D-efficient design is most efficient in the region where the true population VOT is near the prior used to generate the design: the prior is $20/h and the efficient range is $10–$30/h. However, the D-efficient design quickly becomes the most inefficient outside of this range (under $5/h and above $40/h), and the estimation significantly degrades above $50/h. The orthogonal and random designs are robust for a much larger range of VOT. The robustness of Bayesian efficient designs varies depending on the variance that the prior assumes. Implementing two-stage designs that first use a small sample to estimate priors are also not robust relative to uninformative designs. Arguably, the random design (which is the easiest to generate) performs as well as any design, and it (as well as any design) will perform even better if data cleaning is done to remove choice tasks where one alternative dominates the other.

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Organisations: Department of Management Engineering, Transport DTU, Transport Modelling, University of California at Berkeley, Massachusetts Institute of Technology
Corresponding author: Walker, J. L.
Contributors: Walker, J. L., Wang, Y., Thorhauge, M., Ben-Akiva, M.
Number of pages: 24
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Publication date: 2018
Actual preferences for EV households in Denmark and Sweden

Battery electric vehicles (EVs) have received vast attention in the recent decade, especially due to their potential environmental benefits. The car industry has invested huge amounts in the battery electric vehicle technology, leading to a much larger selection of car models with better comfort, driving range and options for recharging the batteries. Several studies have indicated that a great share of car households would now be able to maintain their current mobility patterns with only a minor level of adaption (Christensen 2011; Pearre et al. 2011; Greaves et al. 2014). Still, the driving range of a fully recharged EV is of great importance to the potential users (Jensen et al. 2013; Dimitropoulos et al. 2013; Mabit & Fosgerau 2011; Franke & Krems 2013), but as the battery capacity of the EVs continue to increase, the mobility constraints related to former EV models will most probably be reduced. Thus, the EV alternative has changed from being a product for a very small group of enthusiasts to being an actual car alternative for a common household and knowledge about which type of households would be interested in EVs is extremely valuable for both industry and policy makers. However, as the EV market is still quite immature in most countries, lack of data on EV users is a common problem for researchers. Data on EV purchase and use have thus often been collected by means of data from intentional statements (see e.g. Bühler et al. 2014), stated preferences (see e.g. Bunch et al. 1993; Hidrue et al. 2011; Jensen et al. 2014) and EV vehicle trials (Golob & Gould 1998; Franke & Krems 2013; Jensen et al. 2014). While such studies have provided important insight into various areas of the EV market, the fact that the results are not based on actual behaviour means that they are subject to a high degree of uncertainty. Being the global EV market forerunner, Norway has a better foundation for studying the EV market based on actual EV owners. On these grounds, Klöckner et al. (2013), studied differences in car use between EV and conventional vehicle (CV) users. Also in Norway, Mersky et al. (2016) and Bjerkan et al. (2016) both studied the effect of policy incentives on EV purchase. Compared to these existing studies, we contribute to the literature with a more advanced model to study the EV market and we focus on the market in Denmark and Sweden. In particular, we use revealed preference information to investigate how household characteristics, attitudes, norms, perceived barriers and perceived functional attributes of the EVs affect the probability of being an EV household. The data utilized in this study was collected in connection with the EU project GREAT, which aims to reduce fossil emissions by improving supply for alternative-fuelled vehicles in northern Europe. Besides detailed individual and household characteristics from a sample of both EV and CV household users, the data contains detailed information on individual determinants of EV adoption based on the Theory of Planned Behaviour (Ajzen 1991). Data were collected through an online survey in Sweden and Denmark. The Swedish study was distributed through different channels including the intranet of regions Skåne and Västra Götaland, different newsletters and EV related facebook groups. In Denmark, EV users were contacted via the infrastructure provider E.ON, while the CV users were contacted through the online panel of the market research institute EPINION. In total 1364 observations are available for Denmark and 1288 for Sweden. Descriptive statistics of the sample show that EV respondents were to a much higher extend male, had a higher household income and higher education level and were more often self-employed, lived less often alone and more often had children compared to CV users. Comparing Tesla users to other EV users, we found that Tesla users perceived less functional barriers in terms of EV usage, had more positive affective attitudes related to driving an EV and felt to a higher degree supported by relevant others to use/buy an EV (subjective norm). Interestingly, they did not report more positive symbolic attitudes in relation to their EV ownership. We modelled the probability of being an EV household with an advanced discrete choice model, taking both household characteristic and the latent determinants of EV adoption into account. A preliminary hybrid choice model with a latent variable for perceived barriers and most relevant household characteristics is presented below for the Danish sample.
Modelling production-consumption flows of goods in Europe: the trade model within Transtools3

The paper presents a new model for trade flows in Europe that is integrated with a logistics model for transport chain choice through Logsum variables. Logsums measure accessibility across an entire multi-modal logistical chain, and are calculated from a logistics model that has been estimated on disaggregated micro data and then used as an input variable in the trade model. Using Logsums in a trade model is new in applied large-scale freight models, where previous models have simply relied on the distance (e.g. crow-fly) between zones. This linkage of accessibility to the trade model makes it possible to evaluate how changes in policies on transport costs and changes in multi-modal networks will influence trade patterns. As an example the paper presents outcomes for a European-wide truck tolling scenario, which showcases to which extent trade is influenced by such a policy. The paper discusses how such a complex model can be estimated and considers the choice of mathematical formulation and the link between the trade model and logistics model. In the outcomes for the tolling scenario we decompose the total effects into effects from the trade model and effects from the logistics model.

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Peer-reviewed: Yes

Accounting for the Theory of Planned Behaviour in departure time choice

Motivating people to change their departure time could play a key role in reducing peakhour congestion, which remains one of the most prevalent transport problems in large urban areas. To achieve this behavioural change, it is necessary to better understand the factors that influence departure time choice. So far departure time choice modelling focussed mainly on objective factors, such as time and costs as main behavioural determinants. In this study, we derived psychological factors based on the Theory of Planned Behaviour, estimated them based on structural equation modelling, and included them into a discrete choice model. The psychological factors were measured based on an online questionnaire addressed to car commuters to the city centre of Copenhagen (N = 286). The questionnaire additionally included a travel diary and a stated preference experiment with nine departure time choice scenarios. All psychological factors had a significant effect on departure time choice and could improve the model as compared to a basic discrete choice model without latent constructs. As expected, the effects of the psychological factors were different depending on framework conditions: for people with fixed starting times at work, the intention to arrive at work on time (as estimated by subjective norm, attitude, perceived behavioural control) had the strongest effect; for people with flexible working hours, the attitude towards short travel time was most relevant. Limitations, the inclusion of additional psychological factors and their possible interactions are discussed.

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Contributors: Thorhauge, M., Haustein, S., Cherchi, E.
How flexible is flexible? Accounting for the effect of rescheduling possibilities in choice of departure time for work trips

In departure time studies it is crucial to ascertain whether or not individuals are flexible in their choices. Previous studies have found that individuals with flexible work times have a lower value of time for late arrivals. Flexibility is usually measured in terms of flexible work start time or in terms of constraints in arrival time at work. Although used for the same purpose, these two questions can convey different types of information. Moreover, constraints in departure time are often related not only to the main work activity, but to all daily activities. The objective of this paper is to investigate the effect of constraints in work and in other daily trips/activities on the willingness to shift departure time and the willingness to pay for reducing travel time and travel delay. We set up a survey to collect detailed data on the full 24-hour out-of-home activities and on the constraints for each of these activities. We then built a stated preference experiment to infer preferences on departure time choice, and estimated a mixed logit model, based on the scheduling model, to account for the effects of daily activity schedules and their constraints. Our results show that measuring flexibility in terms of work start time or constraints at work does not provide exactly the same information. Since one-third of the workers with flexible working hours in the survey indicated that they have restrictions on late work-arrival times, their willingness to pay will be overestimated (almost doubled) if flexibility information is asked only in terms of fixed/flexible working hours. This clearly leads to different conclusion in terms of demand sensitivity to reschedule to a later departure time. We also found that having other activities and constraints during the day increases the individuals' willingness to pay to avoid being late at work, where the presence of constraints on daily activities other than work is particularly relevant for individuals with no constraints at work. The important impact of these findings is that if we neglect the presence of constraints, as is common practise in transport models, it will generally lead to biased value-of-time estimates. Results clearly show that the shift in the departure time, especially towards a late departure time, is strongly overestimated (the predicted shift is more than double) when the effect of non-work activities and their constraints is not accounted for.
Departure time choice: Modelling individual preferences, intention and constraints.

Copenhagen – like most other major cities – is facing problems with congestion, (especially) related to commuting in densely urban areas, in which the demand is condensed in peak-hours (Mahmassani, 2000; The Forum of Municipalities, 2008). A number of studies have shown that people are more likely to change their departure time rather than changing their transport mode to avoid congestion (Hendrickson and Planke, 1984; SACTRA, 1994; Kroes et al., 1996; Hess et al., 2007a). Hence, understanding the departure time choice from an individual perspective is important to develop policies aimed to address growing congestion issues. A common approach to study departure time choices is the Scheduling Model originally formulated by Small (1982). Assuming that people have a specific preferred arrival time, the basic concept of the scheduling model is that individuals choose their departure time as a trade-off between travel time and a delay “penalty” resulting from being late or early. However, studying departure time choice is complicated as it is affected by additional factors. Firstly, it is related to a range of other trip-related decisions such as choice of mode, destination and trip purpose. Secondly, it is more generally related to the overall activity schedule of activities. Such an activity schedule is planned in coordination with household members as well as other social interactions, e.g. friends, colleagues, clients, etc. When considering activities within the activity schedule it is important to consider the level of flexibility (or lack of the same) as well. Flexibility is a complex issue affecting departure time in multiple dimensions. The most straightforward constraint when studying commuter trips is on the arrival time at the work place (e.g. due to individuals having fixed or flexible working hours) as the penalty of late arrival is very likely to be higher for individuals with constraints on arrival time. However, flexibility is not only a matter of fixed arrival time. Activities can be mandatory or discretionary (Yamamoto and Kitamura, 1999), performed alone or jointly with family and/or friends (Thorhaege et al., 2012), and restricted or non-restricted in terms of time and space (Bowman and Ben-Akiva, 2000). Depending on the type of activity, temporal, spatial and/or social constraints might play an important role in scheduling the activities and in choosing a specific departure time. Parallel with the micro-economic theory, the psychology literature has evidenced that individuals’behaviours are driven by underlying latent constructs, such as attitude, norms and in perceptions. In the past decades, more attention has been given to incorporate and understand underlying psychological effects (such as attitude, norms, etc.) into discrete choice models (Koppelman and Lyon, 1981; Orttuzzar and Hutt, 1984; McFadden, 1986). However, most studies usually focus only on a few latent constructs, often considering only attitudes (see e.g. Daly et al., 2012; Jensen et al., 2013; Paulssen et al., 2013; Kamargianni and Polydoropoulou, 2013; Kamargianni et al., 2014). None of these studies, nor any studies in the psychological literature, deal with the departure time problem. It is reasonable to believe that the departure time choice can also be substantially affected by individuals’ attitudes, norms and perception towards being on time (or towards reducing travel and cost) other than by objective measures of time and costs. Arellana et al. (2012) are the only ones who consider these effects in the context of departure time, though they focus only on attitudes. This thesis approaches the problem of the departure time choices for car commuters in the greater Copenhagen area under a more general framework that recognises that the choice of when to depart is affected by both micro-economic and psychological factors. Moreover, it is not an isolated decision, but rather a decision within a complex activity decision chain, where constraints imposed by one activity can affect all other activities in the chain and in particular the preference for the departure time to work. Constraints can be objective (temporal, spatial and social) and directly affect individual departure time choice, but can also be perceived by the individuals as barriers towards participating in activities. Perceived constraints affect the departure time choice through the individual intention of being on time. This PhD thesis also contributes to the departure time literature by discussing the problem of collecting appropriate data to analyse departure time choices. The travel time variation observed in repeated preference data is usually not large enough to be able to identify departure time preferences. For this reason, much recent research has used stated preferences data. Building stated preference designs is especially challenging for departure time studies because of the interdependence among attributes and the challenge of ensuring realism in the stated questions. Orthogonal designs were the predominant way of building stated experimental designs, while nearly none of the departure time studies have relied on efficient experimental designs. Koster and Tseng (2009) presented the first efficient design for departure time studies. Later, Arellana et al. (2012b) developed a pivoted efficient design including activity participation time (i.e. duration) at work. In order to create the design they had to sacrifice the traditional one-step process of creating efficient designs, thus relying on a two-step efficient design which reduces the efficiency. To the best of my knowledge, no researchers have used a fully efficient stated preference experimental design for the scheduling model. Summarising, the contribution of this PhD thesis is as follows. Firstly, it provides evidence of a fully efficient stated choice design for a departure time context. Using a pivot design (Rose et al., 2008) built around a reference trip (usually from the day before), the thesis shows that the efficient design performs well in cases where good prior knowledge about the parameters is available. Secondly, it investigates the impact of accounting for a daily activity schedule and the corresponding constraints. It shows the importance of taking the daily activity schedule and their constraints into consideration. In particular, the thesis explores whether and to which extent the willingness to shift departure time to avoid congestion and willingness to pay for reducing travel time and travel delay to work is affected by the way information on flexibility at work is collected and by other trips/activities realised during
the day and also whether they are constrained. The thesis also provides empirical evidences of the policy implication of not accounting for other activities and their constraints. Thirdly, the thesis shows that the departure time choice can be partly explained by psychological factors, which have previously been neglected by nearly all studies within departure time. More importantly it shows that the underlying psychological processes are more complex than simply accounting for attitudes and perceptions which are typically used in other areas. The work in this PhD thesis accounts for the full Theory of Planned Behaviour (Ajzen, 1991), in which Intention act as a mediator between the underlying latent factors (attitude, norms, and perception). It was found that the psychological factors not only influenced the choice but also individual preferences.

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- **Contributors**: Thorhauge, M.
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- **Electronic versions:** Mikkel_Thorhauge_PhD_m_omslag.pdf

**The effect of perceived mobility necessity in the choice of departure time**

Departure time choice plays a crucial role in addressing the problem of urban congestion. Since the work of Small (1982), many studies have shown that travelers trade-off between travel time and scheduling delay and that travel time variability also plays an important role because uncertainty is likely to affect the choice of departure time. However departure time choice is also related to the full daily activity pattern, such as a restriction or a preference in one activity may form restrictions in the flexibility of other activities and thereby affect the preference for the related departure time. In this paper we investigate how the latent effect of the perceived mobility necessities affects the choice of departure time. A stated choice experiment collected among workers who commute to Copenhagen center is used to estimate 9 hybrid choice models where the discrete choice of departing before or later than the current trip depends on the latent construct of the perceived mobility necessities. Results show that individuals who perceive they have high mobility necessity tend to prefer the current departure time, and in particular dislike departing later. However the latent variables account also partially for panel effect across choice tasks.

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- **Contributors**: Thorhauge, M., Cherchi, E., Rich, J.
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**A survey of joint activities and travel of household members in the Greater Copenhagen Metropolitan Region**

The traditional approach for modeling transport-related choices in Denmark refers to individual decision makers. However, in daily activities and travel choices individuals function according to the commitments as family members, and thus their choices derive from the welfare needs of other family members. A family-based approach enables to capture intra-household interactions and the priorities of household members in scheduling their daily activities, thus adding to the realism and the predictive strength of transport models. Joint activities and travel occur in order to maximize efficiency and family quality time, within a daily schedule. The current study unveils the joint activity and travel patterns of household members in the Copenhagen area, as part of the ACTUM research project, funded by the Danish Strategic Research Council, for the development of a new generation of activity-based models in Denmark.

**General information**

- **Publication status**: Published
- **Organisations**: Department of Transport, Traffic modelling and planning, Danish Road Directorate
Optimization of timetable supplement from a passenger based socio-economic point of view
This article discusses how to optimize the timetable supplement in timetables. The focus of this article will be on railways, but the principle will in theory apply to all transportation modes within the area of public transportation. When constructing timetables it is important to plan the right amount of timetable supplement. Too little timetable supplement will result in many delays, while too high timetable supplement will result in a (too) high planned travel time which will affect every departure whether or not the train is delayed. At present timetable supplement is chosen based on experience or estimates. Through a mathematical optimization it is possible to find the optimal timetable supplement. A way to do so is by using the passenger delay model in a socio-economic analysis as done by (Thorhauge & Piester, 2010). A case study of an upgrade of Sydbanen between Ringsted and Rødby has been conducted using the passenger delay model and the methods are described in this article. The case study has shown that the optimum timetable supplement is between 6-9 % depending on the scenario. By optimizing the timetable supplement it is possible to achieve a surplus of 250-500 mio. DKK during the evaluation period compared to the proposed timetable by the Danish Transport Authority (Trafikstyrelsen, 2008). Note however that none of the investigated scenarios are socio-economic viable even though the timetable and timetable supplement is optimized. Note that this paper is regarded as a sequel to the article “The usability of passenger delay models in socio-economic analysis” (Thorhauge, 2010). This article is based on the results of (Thorhauge & Piester, 2010).

The usability of passenger delay models in socio-economic analysis
The following paper discusses how a passenger delay model can be used in socio-economic calculations. At present passenger delays are often omitted in the modeling phase and therefore not included in the analysis. By using a passenger delay model passenger delays can be included in a cost-benefit analysis. Including passenger delays in the cost-benefit analysis will increase the level of details and thereby improve the accuracy of socio-economic analysis. In this paper the third generation passenger delay model is used. This model is the newest and most detailed passenger delay model created so far. The main problem when including passenger delays is to determine the value of time for passenger delays and how to include the delays in a socio-economic analysis. This is due to the fact that passenger delays are not defined unambiguously. In general, delays can occur on different parts of a journey; while the passengers are waiting for the train (waiting time, first waiting time or even hidden waiting time) or while the passenger are sitting in the train (or bus). Furthermore a delay can also be negative, meaning that a passenger will arrive before planned (a so-called negative
It is necessary to consider how to define the value of time for the different types of delays as well as how to include these elements in a cost-benefit analysis. This article proposes that a delay is defined solely by the difference between the scheduled and realized arrival time. The recommendations are listed as follows:

- The value of time for a delay is defined as done by the Danish Ministry of Transport (Trafikministeriet, 2003) no matter how or when the delay has occurred. The size of the delay is calculated solely by the difference between the planned and realized arrival time.
- A negative delay is defined as the value of time of hidden waiting time. A negative delay is calculated as the difference between the planned and realized arrival time and is considered a surplus in the cost-benefit analysis.
- A delay will not be included if the passenger arrives at his or her final destination on time even though the passenger may have experienced a delay (or traveled along a different route than planned) during the journey.

Note that this paper is regarded as a prequel to the article “Optimization of timetable supplement from a passenger-based socio-economic point of view” (Thorhauge, 2010). This article is based on the results of (Thorhauge & Piester, 2010).
Degree of recognition: International

Related event

hEART 2018: 7th Symposium of the European Association for Research in Transportation
05/09/2018 → 07/09/2018
Athens, Greece
Activity: Talks and presentations › Conference presentations

Departure Time Choice: Modelling Individual Preferences, Intention and Constraints (Institute for Choice Seminar)
Period: 8 Nov 2017
Mikkel Thorhauge (Guest lecturer)
Department of Management Engineering
Transport DTU
Transport Modelling
Degree of recognition: International

Related external organisation

University of South Australia
Level 13/140 Arthur St, 2060, North Sydney NSW, Australia
Activity: Talks and presentations › Guest lectures, external teaching and course activities at other universities

University of South Australia
Period: 1 Aug 2017 → 30 Jun 2018
Mikkel Thorhauge (Visiting researcher)
Department of Management Engineering
Transport DTU
Transport Modelling
Degree of recognition: International
Activity: Visiting an external institution › Visiting another research institution

Actual preferences for EV households in Denmark and Sweden
Period: 2017
Anders Fjendbo Jensen (Speaker)
Mikkel Thorhauge (Other)
Sonja Haustein (Other)
Elisabetta Cherchi (Other)
Transport DTU
Transport Modelling
Department of Management Engineering
Technology and Innovation Management
Degree of recognition: International

Related event

hEART 2017: 6th Symposium of the European Association for Research in Transportation
12/09/2017 → 14/09/2017
Haifa, Israel
Activity: Talks and presentations › Conference presentations

Departure Time Choice: Modelling Individual Preferences, Intention and Constraints (Doctoral workshop)
Period: 2017
Mikkel Thorhauge (Speaker)
**Modelling production-consumption flows of goods in Europe: the trade model within Transtools 3**

**Period:** 5 Oct 2016

**Gerard de Jong** (Speaker)
**Reto Tanner** (Other)
**Jeppe Rich** (Other)
**Mikkel Thorhauge** (Other)
**Otto Anker Nielsen** (Other)
**John Bates** (Other)

**Department of Management Engineering**
**Transport DTU**
**Transport Modelling**

**Description**
Estimation results and elasticities are presented for the trade model within the European transport model Transtools3. We also explain how the outcomes of this model are used in the overall freight model.

**Degree of recognition:** International

**Documents:**
Trademodel TT3 ETC_2016_v1

**Related event**

**European Transport Conference 2016**

**05/10/2016 → 05/10/2016**

**Barcelona, Spain**

**Keywords:** TransTools 3, Trade Model, Freight Model, Transport Model

**Activity:** Talks and presentations › Conference presentations

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**A model for freight transport chain choice in Europe**

**Period:** 14 Sep 2016 → 16 Sep 2016

**Anders Fjendbo Jensen** (Speaker)
**Mikkel Thorhauge** (Other)
**Gerard de Jong** (Speaker)
**Jeppe Rich** (Other)
**Thijs Dekker** (Other)
**Daniel Johnson** (Other)
**Manuel Ojeda Cabral** (Other)
**John Bates** (Other)
**Otto Anker Nielsen** (Other)

**Department of Management Engineering**
**Transport DTU**
**Transport Modelling**

**Description**
This paper describes the structure of the Transtools3 freight transport chain choice model for Europe and the data at the shipment level that were used in estimation, and presents the estimation results and resulting elasticities. It also discusses the structure of the overall freight model and how production-consumption matrices from a trade model are combined with the transport chain choice model in model application. In the estimation of the transport chain choice model on the available disaggregate data sources (the Swedish Commodity Flow Survey 2009 and the French ECHO survey) we tested several options for the specification of transport costs in the model and various nesting structures.

Related event

heart 2016
14/09/2016 → 16/09/2016
Delft, Netherlands
Keywords: TransTools 3, Logistics Model, Freight Model, Transport Model
Activity: Talks and presentations › Conference presentations

Synthesis of household based trip diaries
Period: 14 Sep 2016
Mikkel Thorhauge (Speaker)
Jeppe Rich (Other)
Department of Management Engineering
Transport DTU
Transport Modelling
Documents:
Thorhauge - Trafikdage 2016 - Synthetic HH

Related event

heart 2016
14/09/2016 → 16/09/2016
Delft, Netherlands
Keywords: Trip Diaries, Hot deck imputation, Activity Patterns
Activity: Talks and presentations › Conference presentations

Udvikling af transportvaneedata for husholdninger
Period: 23 Aug 2016
Mikkel Thorhauge (Speaker)
Jeppe Rich (Other)
Department of Management Engineering
Transport DTU
Transport Modelling
Degree of recognition: National
Documents:
Thorhauge - Trafikdage 2016 - Synthetic HH

Related event

Trafikdage 2016
22/08/2016 → 23/08/2016
Ålborg, Denmark
Keywords: Transportvaneundersøgelsen, TU, Travel diaries
Activity: Talks and presentations › Conference presentations

Departure Time Choice: Modelling Individual Preferences, Intention and Constraints (Awards winner's presentation)
Period: 2016
Mikkel Thorhauge (Speaker)
Transport DTU
Transport Modelling
Department of Management Engineering
Degree of recognition: National

Related event

Trafikdage 2016
22/08/2016 → 23/08/2016
Ålborg, Denmark
Activity: Talks and presentations › Conference presentations

The Role of Intention as Mediator Between Latent Effects and current Behaviour: Application of a Hybrid Choice Model to Study Departure Time Choices
Period: 2016
Mikkel Thorhauge (Speaker)
Elisabetta Cherchi (Other)
Joan Walker (Other)
Jeppe Rich (Other)

Transport DTU
Transport Modelling
Department of Management Engineering
Traffic modelling and planning

Related event

Transportation Research Board (TRB) 95th Annual Meeting
10/01/2016 → 14/01/2016
Washington, D.C, United States
Activity: Talks and presentations › Conference presentations

D-Efficient or Deficient? A Robustness Analysis of SP Experimental Designs In a VOT Estimation Context
Period: 2015
Joan Walker (Other)
Yanqiao Wang (Other)
Mikkel Thorhauge (Other)
Moshe Ben-Akiva (Speaker)

Transport DTU
Transport Modelling
Department of Management Engineering
Degree of recognition: International

Related event

94th Annual Meeting of the Transportation Research Board
11/01/2015 → 15/01/2015
Washington D.C., United States
Activity: Talks and presentations › Conference presentations

Departure time choice modelling (SafeTREC-UCTC Seminar)
Period: 7 Feb 2014
Mikkel Thorhauge (Speaker)

Department of Management Engineering
The focus of this study is departure time choice modeling of car commuters in the morning rush hours. To model this we use the approach first formulated by Small (1982), i.e. the Scheduling Model. This study will contribute to the research of departure time choice modeling in three distinct ways. Firstly, by designing an efficient stated choice design specifically built to capture the trade-offs being made in the choice of departure times. Secondly, to account for detailed level of flexibility not only in relation to the specific trip under question, but for trips and activities throughout a 24 hour time period. This is important because a crucial problem when studying departure time is that the choice of when to realize a given trip is (often) related to the full daily activity pattern, such as a restriction or a preference in one activity may form restrictions in the flexibility of other activities and thereby affects the preference for the related departure time. And thirdly, to incorporate latent variables to measure underlying preferences that potentially affect departure time following the Theory of Planned Behavior, as these preferences are believed to be an important factor in explaining behavior.

Related event

Trafikdage Aalborg 2014
25/08/2014 → 26/08/2014
Aalborg, Denmark
Activity: Talks and presentations › Conference presentations

The Effect Of Perceived Mobility Necessity in the Choice of Departure Time
Period: 2014
Mikkel Thorhauge (Speaker)
Elisabetta Cherchi (Other)
Jeppe Rich (Other)
Transport DTU
Transport Modelling
Department of Management Engineering
Traffic modelling and planning
Degree of recognition: International
Related event

Transportation Research Board 93rd Annual Meeting
12/01/2014 → 16/01/2014
Washington DC, United States
Activity: Talks and presentations › Conference presentations

University of California at Berkeley
Period: 17 Sep 2013 → 14 Feb 2014
Mikkel Thorhauge (Visiting researcher)
Department of Management Engineering
Transport DTU
Transport Modelling
Degree of recognition: International
Activity: Visiting an external institution › Visiting another research institution

Accounting for the Effect of Rescheduling Possibilities in the Departure Time Choice using an Efficient Stated Preference Design
Period: 2013
Mikkel Thorhauge (Speaker)
Elisabetta Cherchi (Other)
Jeppe Rich (Other)
Transport DTU
Transport Modelling
Department of Management Engineering
Traffic modelling and planning
Degree of recognition: International

Related event

hEART 2013: 2nd Symposium of the European Association for Research in Transportation
04/09/2013 → 06/09/2013
Stockholm, Sweden
Activity: Talks and presentations › Conference presentations

ACTUM Project: Joint Activities and Travel of Household Members
Period: Aug 2012
Mikkel Thorhauge (Speaker)
Sigal Kaplan (Other)
Goran Vuk (Other)
Traffic modelling and planning
Degree of recognition: National

Related event

Trafikdage på Aalborg Universitet 2012
27/08/2012 → 28/09/2012
Aalborg, Denmark
Activity: Talks and presentations › Conference presentations

Samfundsekonomiske fordele i køreplaner ved hjælp af passagerforsinkelsemodeller
Period: 9 May 2012
Mikkel Thorhauge (Speaker)
Department of Management Engineering
Transport DTU
Transport Modelling
Degree of recognition: National
Documents:
Mikkel_Thorhauge_Banekonferencen_2012

Related event
Danish Railway Conference 2012
09/05/2012 → …
Copenhagen, Denmark
Activity: Talks and presentations › Conference presentations

Optimization of timetable supplement from a passenger based socio-economic point of view
Period: Aug 2010
Mikkel Thorhauge (Speaker)
Department of Transport
Degree of recognition: National

Related event
Trafikdage 2010
23/08/2010 → 24/08/2010
Aalborg, Denmark
Activity: Talks and presentations › Conference presentations

The usability of passenger delay models in socio-economic analysis
Period: Aug 2010
Mikkel Thorhauge (Speaker)
Department of Transport
Degree of recognition: National

Related event
Trafikdage 2010
23/08/2010 → 24/08/2010
Aalborg, Denmark
Activity: Talks and presentations › Conference presentations

Prizes:
CITRIS Visiting Scholarship Grant for UC Berkeley
Mikkel Thorhauge (Recipient)
Department of Management Engineering, Transport DTU, Transport Modelling
Details
Awarded date: 2013
Degree of recognition: International
Prize: Prizes, scholarships, distinctions

Prof. P.H. Bendtsens Transport Research Award
Mikkel Thorhauge (Recipient)
Department of Management Engineering, Transport DTU, Transport Modelling
Details
Awarded date: 22 Aug 2016
Degree of recognition: National
event: Trafikdage 2016
Prize: Prizes, scholarships, distinctions