



Car dependent practices: Findings from a sequence pattern mining study of UK time use data



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ABSTRACT

This paper identifies three main understandings of the notion of 'car dependence' in transport research: a *micro*-social understanding (dependence as an attribute of individuals), a *macro* approach (attribute of societies or local areas as whole), and a *meso*-level understanding, where it refers to trips – or rather to the activities that people travel to undertake. While the first two approaches have been dominant, this paper further develops the third, addressing questions as to whether and why certain activities are inherently more difficult to switch away from the car. At the theoretical level, it builds on theories of social practice to put forward the notion of 'car dependent practices'. At the empirical level, it demonstrates that the application of sequence pattern mining techniques to time use data allows the identification of car and mobility intensive activities, arguably representing the trace of car dependent practices. Overall, the findings of this mining exercise suggest that the emphasis of existing literature on escorting children, shopping and carrying heavy goods as car dependent trip purposes is not misplaced. Our analysis adds to this knowledge by contextualising the information by providing detailed quantitative analysis of a larger, richer set of activities hitherto overlooked in transport policy. The article concludes by illustrating the policy implications of the approach adopted and the findings generated, discussing possible strategies to steer practices in a more sustainable direction by creating material alternatives to the 'cargo function' of car travel.

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1. Introduction

Despite wide acknowledgement that current transport patterns in developed countries are major contributors to global environmental externalities such as fossil fuel depletion and climate change, the field of sustainable transport policy remains characterised by a large gap between goals and accomplishments (Bache et al., 2014; Schwedes, 2011). Indeed, transport is the only sector where greenhouse gases emissions have increased from the 1990 baseline in the EU-27 with road transport responsible for 71.7% of them (EC, 2012).

In transport research and policy literature, use of the term 'car dependence' is widespread. At a very general level, it is used to draw attention to the fact that current sustainable transport policies are ineffective in reducing the demand for private motorised travel, that more radical policies are difficult to implement because of public and political acceptability concerns and that the car is deeply ingrained in our societies with consequent social barriers to sustainable transport. Overall,

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the notion of car dependence is “(a) testimony of the difficulty of moving away from the car system, despite the increasing awareness of the negative externalities” (Mo.Ve. Association, 2008, p. 3).

Despite this common sentiment, the term is used in a variety of ways in the literature. This co-existence of different meanings has fostered recurrent complaints among scholars that the concept is not properly addressed or defined (Gorham, 2002; Lucas and Jones, 2009; Mo.Ve. Association, 2008). In this paper, it is argued that the discouraging variety of definitions can be better disentangled by drawing on basic sociological concepts (structure, agency, etc.) and that there are in fact only three different understandings of ‘car dependence’, corresponding to three levels of analysis: *micro* (car dependence as an attribute of individuals), *macro* (attribute of society and/or the built environment) and *meso* (attribute of particular trips, activities or practices). This typology is presented in Section 2. Notably, while the micro- and the macro-understandings have been prevalent so far, they tend to overlook either structural constraints that are external to the individual (micro) or the role of human action in reproducing existing car-oriented structures (macro). Therefore, we argue that it is necessary to further develop a meso-level understanding of car dependence. From a theoretical point of view, theories of (sustainable) social practice, treading a middle course between agency and structure, are a useful resource for this endeavour. They are introduced in Section 3, along with a working definition of ‘car dependent practices’. From an empirical point of view, the article demonstrates that the application of quantitative methods (sequence visualization and pattern mining techniques) to large, information-rich datasets (time use data) allows the identification of *activities* that are most likely to be sequenced with car travel. These in turn are taken to represent the trace of car dependent *practices*, as discussed in Section 4. The dataset, data analysis techniques and the software employed are introduced in Section 4 along with the calculation of the car and mobility intensity indices. Section 5 presents the findings of the study based on data from the 2000 British Time Use Survey, which are discussed in Section 6. Section 7 discusses the policy implications of the approach adopted and the findings generated. Section 8 discusses possible future research directions.

2. Car dependence: a typology

Several attempts have been made to summarise existing definitions of car dependence and to create a simple typology (Gorham, 2002; Jeekel, 2013; Lucas and Jones, 2009; Mo.Ve. Association, 2008; Stradling, 2003). However, the variety of competing categorizations is still large. This paper uses these literature reviews as a basis to put forward a very simple typology of *understandings or approaches to the study of car dependence* – in a ‘review of reviews’ of sorts (Table 1).

The micro-understanding of car dependence is also the most widespread. The distinguishing feature here is that dependence is an attribute of the individual, who is considered to rely or depend on the car with dependence able to be defined from weak to strong (Goodwin et al., 1995; Zhao, 2011). In other words, this approach is concerned with questions of agency (or lack thereof). Typically, however, authors distinguish between two types of car dependence at the micro-level. Farrington et al. (1998, p. 3, quoted in Stradling, 2003), for example, make a distinction between *conscious* (for “those who rely on their vehicle but could realistically undertake their journeys by alternative modes”) and *structural* dependence (for “those who are dependent on the car because there are no viable alternatives”). Similar distinctions are found in Lucas and Jones (2009), Anable (2005) and in the Mo.Ve Association report (2008).

‘Conscious’ dependence is a prime example of what Shove (2010) critically defines as the dominant ‘ABC’ (attitude, behaviour and choice) paradigm of climate change policy and research: resistance to change is motivated by ‘pro-car’ attitudes, that prompt individuals to choose car use (behaviour), regardless of other circumstances (availability of other modes, etc.). By contrast, in the case of ‘structural’ dependence, the problem lies with obstacles to free choice that override the influence of attitudes. While such factors might sometimes be individual attributes (e.g. disability), in most cases they are better thought of as *contextual or external* factors. Therefore, the notion of a ‘structurally car dependent person’ is contradictory and potentially confusing in that the unit of analysis is the individual, while the reasons for dependence are generally attributes of other entities (local areas, institutional timetables, social norms, etc.). While it makes sense to focus on individuals

Table 1

Typology of understandings or approaches to the study of car dependence, based on definitions found in existing literature reviews.

Macro	Physical/environmental car dependence (G) Car dependent places (S) A car dependent city (M) A car reliant location; a car reliant society (LJ) Car dependent locations; car dependent times; car dependent societies (J)
Meso	Circumstantial car dependence (G) Car dependent trips (S) A car reliant trip; a car reliant activity or journey purpose; a car reliant lifestyle; a car convenient journey (LJ) Car dependent activities (J)
Micro	Psycho-social car dependence (G) Car dependent people (S; J) Car reliance of individuals; car dependence of individuals (M) A car reliant person; a car dependent person; a car addicted person (LJ)

Legend: G (Gorham, 2002); J (Jeekel, 2013); M (Mo.Ve. Association, 2008); LJ (Lucas and Jones, 2009); S (Stradling, 2003).

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