



The Car in British Society

Working Paper 2: Literature Review

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EXECUTIVE SUMMARY

Aims and objectives

The literature review was designed to offer an update on academic thinking since the previous 1995 Car Dependence study for the Foundation, which was led by the ESRC Transport Studies Unit at Oxford University. It particularly considered whether the concept of *car dependence* is still a useful way of characterising the situation in the present context and the empirical evidence to support or refute this claim. It also aimed to explore the literature concerning the economic and social consequences of moving beyond current largely voluntary reductions in car use towards future policy measures that may be more coercive in nature.

Methods

The review was based on web-based searches of key journal articles and other academic texts published since 1995. A policy and grey literature review also formed part of the study and the findings from this are reported in a separate working paper (WP3).

Key findings

- i) The literature establishes that there are huge advantages to be gained from car-based travel, not only in terms of the access it offers individuals to key economic and social activities but also in terms of its socio-psychological benefits for certain individuals, such as status and self-esteem, independence, socialisation and broadening aspirations and cognitive horizons.
- ii) The term 'car dependence' has often been used interchangeably in the literature to describe this broad spectrum of quite different kinds of car use behaviours and it is, thus a confusing, often emotive and rather unhelpful descriptor of the current situation in terms of people's car use behaviours. In most instances, the term *dependence* is used in the sense of 'reliance on' and **is not** necessarily intended to imply an *addictive* or *pathological* behaviour.
- iii) Socio-psychological theories and models of car use behaviour establish that the key over-riding motivation behind people's preferences for car-based travel is habit, but that this is also influenced by a personal intention to make this choice.
- iv) People's choices will be affected by their past experiences of other modes and also their current perceptions of its availability, efficiency, convenience. They will usually offer an *heuristic* or 'rule of thumb' assessment of this when asked to reflect on the possibility of using alternative options. Often these assessments are borne out in case of fact, which helps to reaffirm people's behaviour choices and embed their existing behavioural patterns.
- v) Different kinds of drivers will have different underlying reasons for making their travel choices, based on socio-demographic characteristics, social and psychological motivations, economic and physical circumstances and their roles and responsibilities.

This finding suggests that, to be more effective, policy interventions to change people's car use behaviours need to be more sensitive to the many different reasons why people prefer to travel by car and more responsive to these different underlying motivations.

- vi) Policies need to simultaneously employ multi-instruments (i.e. using fiscal incentives and disincentives, information and awareness-raising campaigns, technological fixed and infrastructure and service improvement in a seamless and integrated manner), be multi-levelled (i.e. simultaneously targeted at individuals, businesses and institutions locally, nationally and internationally) and be context and audience specific.
- vii) Even if this approach is followed people are likely to be highly resistant to behaviour change, where their car use is concerned. We know that many people are prepared to hold on to their existing car use behaviours even when this requires compromising other areas of household expenditure or putting up with adversarial driving conditions, such as congestion. They will even do this when there appear to be affordable and convenient alternatives available to them.

Conclusions and recommendations

There is currently a general lack of rigorous evaluation of precisely what does and doesn't work in policy terms in reducing reliance on the car. More importantly in terms of our study, the economic and social consequences of significantly reducing people's car use and the wider costs of such an adjustment is very poorly understood by both academics and policymakers. There is a useful body of literature describing conceptual models of how people cope with involuntary modification to their lifestyles, which could provide some useful insights into the processes through which people would adjust to car use reduction. In addition, there is literature on estimating the costs of adjusting to other life shocks, such as unemployment, disability, and divorce.

Some limited empirical evidence already exists on individuals' behavioural responses to petrol price increases, congestion charging and other enforced reductions in car use, but this is a highly under-researched area and only looks at short term costs of adjustment. However, we could find no evidence to suggest the wider social and economic impacts of significant car use reduction over the longer term. We believe it is vital that research provides better insights into these issues before we enter blindly into policy scenarios that run the risk of undermining the very basis of people's economic and social well-being.

1. Introduction

This working paper presents review and critical analysis of the literature focuses on changes in individual and household private vehicle behaviours, levels of reliance and discussions surrounding the existence or not of a car dependency culture in the UK now and in the future. It also considers the existing evidence base for assessing the likely cost of adjustment to individuals and society as a whole of significant reductions in current car use levels. The review forms part of a wider study commissioned by the RAC Foundation which aims to offer deeper insight into the changing nature and causes of people's car use behaviours in the context of a range of institutional and policy factors that might influence this. A copy of the main report for the study and the other accompanying working papers which inform this can be downloaded from the RAC Foundation website at www.racfoundation.org.

2. Aims and objectives

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3. Method

The review was based on web-based searches of key journal articles and other academic texts published since 1995. A policy and grey literature review also formed part of the study and the findings from this are reported in a separate working paper (WP3).

4. The benefits of car-based travel over other modes

The study began with a critical review of the literature pertaining to people's travel choices and our apparent dependence on car based travel not only as individuals but also as a society as a whole. A first step of this review has been to unpack the often confused and at times highly emotive language that has been used. Clearly there are huge advantages to be gained from car-based travel in terms of the access it offers individuals to key economic and social activities that, arguably, could not be as well served by other forms of transportation. Numerous textbooks and academic articles refer to this as a *derived demand*, implying that it is not the car travel itself that is the primary benefit, but rather the opportunity to access goods and services that it allows. Conversely, Mokhtarian *et al* (2001) argue that travel has an intrinsic positive value in and of itself, which is largely overlooked by theorists and practitioners alike. In their paper, they identify a number of scholarly articles dating back to the early seventies, which describe a positive relationship between the attributes of mobility,

freedom and variety. Other commentators of people's car use behaviours also concur with this view.

For example, Hupkes (1982 in Mokhtarian *et al*, 2001: 357) identifies man as essentially mobile, finding that *'...he cannot easily stay indoors all day long'* and is in need of *'...a change of environment, being in movement, the sensation of speed and freedom, the excitement of handling a powerful vehicle, feeling of pride and ownership of such a vehicle, etc.'* Perhaps in the 21st century we can witness that some of these freedoms have been curtailed by congestion in our towns and cities and the introduction of speed cameras and traffic calming measures on many of our highways, but nevertheless many of them still stand. These more emotive aspects of the benefits of car-based travel are usually downplayed in the policy literature on reducing car dependence, but nevertheless play an important role in the public's continued reliance on the car.

As noted by a recent report from the CSS Transport Futures Group (2008), which was compiled through the contributions of a large number of academics and practitioners from the world of transport in the UK:

'Travel is part of the way we live our lives and this must be taken into account as we look ahead to consider the options open to us for how we live within and as part of our environment'

(CSS, 2008: 4)

The report concludes that, whilst there is evidence that some people are responding to the suggestion that a fulfilment of our social responsibility would mean that we would use our cars less, the advantages of the car over other available modes of transport means that the car is unlikely to diminish in importance for the foreseeable future. The authors point out that throughout history and in all economic conditions people have tended to travel for around 90 minutes per day. They suggest that currently this allows the average person to cover about 4 miles walking, 15 miles cycling, 80 miles driving (in non-congested motorway conditions) or 150 by high speed train.

Repeated surveys have demonstrated that the majority of the population at the present time (even those who do not themselves own cars) favour car travel over any other mode of transport. Travel by car allows us to decide when and where we travel and to control the micro-environment in which we do it. The UK National Travel Survey demonstrated that in 2005, 64% of all trips in the UK were made by car and that travel by car accounted for 61% of all time spent travelling.

The RAC Report on Motoring (published since 1989, originally as the Lex Report) has been monitoring two aspects of this overwhelming reliance on cars (Leibling, 2007). The survey is based on a national sample of around 1,500 regular motorists, defined as those who drive at least once a month. It found that over 80% of motorists say they would find it very difficult to adjust their lifestyle to being without their car. Furthermore, time series analysis suggests that only the people who were already using public transport have increased their use since 1993. The number of people driving a car has risen steadily over this time and the number of frequent car drivers is also on the increase. They conclude from their research that the fact that 50% of people have never used a bus demonstrates them to be unsuitable and unattractive for many people.

In his report for the Reason Foundation, Balaker (2007) succinctly encapsulates the many perceived advantages of the car over public transport:

“Travelers can reach relatively few destinations directly by transit, but motorists can go from (almost) anywhere to (almost) anywhere. Transit service frequency varies according to schedules, but motorists can travel whenever they like. Their travels are not as restrained by fatigue as are walkers and transit users who trek to and from transit stops. Simple conveniences, like trunk-space, make it easier to carry things and additional seating makes it easier to transport small children, the elderly, and handicapped. The enclosed space of a car can also spare travelers from the rain, snow, its own risks, many people feel safer traveling at night or through unfamiliar areas within the confines of a car.”

(Balaker, 2007: 4)

As the Department for Transport (2007) recognises in its response to the recommendations of the Eddington study (2006) and the Stern Review (2006), the positive impacts of transport on people’s quality of life tend to be taken for granted and are, thus, often more difficult to pinpoint or place a value on in monetary evaluations even though people may place a very high value on them in practice. Although there are endless examples of the positive attributes of car travel in the popular press and advertising media, the more recent academic transport literature has tended away from this focus. It is however, highly prevalent in the socio-psychological literature, as demonstrated above. One of the most effective and immediate ways in which to identify the benefits of transport in general and car ownership and use in particular, is to look to the literature that concerns itself with what happens when people in predominantly car-based societies do not have regular access to a private motor vehicle.

5. Recognising the issue of transport poverty in the UK

More than a quarter of households in the UK do not have regular access to a car. So whilst the majority of the population may derive significant benefits from car ownership and use, some people must rely on usually considerably less attractive, slower and often more expensive alternatives, such as buses, taxis or walking. Non-car owning households are overwhelmingly concentrated in the lowest income quintile of the population, with less than half (47 per cent) owning cars; although car ownership among this sector of the population is increasing more rapidly year on year than for the other income sectors (Department for Transport, 2006). This trend of increasing car ownership even amongst the lowest income groups can be taken as an indication of the basic social and economic *need* to own and use cars in highly mobile and affluent societies, such as the UK.

According to the Department for Transport’s (DfT) National Travel Survey in 2006 a person in the highest income bracket will travel 11,588 miles per year whilst those in the lowest income bracket will travel less than half that distance; only 4,124 miles per year on average. As the CSS report notes, once the benefits of travel are identified, this mobility disparity represents a significant constraint on both the opportunities and quality of life of lower income households.

This was confirmed in a 2002/3 study by the Government's Social Exclusion Unit (SEU) (now the Social Exclusion Task Force), which found that a lack of transport was a significant contributing factor in the exclusion of many low-income groups and communities. The study identified that the most significant difference in people's ability to participate was based on car availability within households, i.e. non-car drivers in low-income households found it more difficult to access key services than did their car owning counterparts across all areas of the UK.

Clearly, however, different sectors of the population place more or less importance on their mobility and hold different values for different types of trips, modes and journey purposes; this also changes at different life stages. A recent evidence-based review on mobility for the DfT (2007a) recommends that from childhood people have distinct mobility needs and experiences, which can largely be categorised by their life stages. For younger primary school children the escorted trip to and from school (mostly by car or walking) has an important focus, for older primary school children independent mobility (commonly by public transport) is seen as positive, exciting and adventurous but soon becomes a focus for dissatisfaction for young teenagers.

The review finds that as we get older, the need to travel is largely determined by the demands that are placed upon us; to travel to work, escort children to school, shop, etc. It suggests that the high reliance of parents on their cars reflects the multiple demands on, and time pressures of their busy lives. Gender also plays a big part in determining the diversity of travel needs and experiences among adults. Men are still more likely to have access to a car, make more commuter trips and are less likely than women to be responsible for the home childcare, including shopping for food and escorting children to school. Declining mobility and health in older age can often mean having to give up driving, with associated reductions in the ability of older people to access essential services.

In their study of the car use of Finnish men and women over the age of 65 years, Siren and Hakamies-Blomqvist (2004) argue that independent community-related mobility is a fundamental factor in the continued well-being of older people. Identifying that reduced mobility is associated with loss of independence, reduced general activity, poorer health and increased depression. Not surprisingly, leisure trips (broken down into those for no special purpose, hobby-related and those to access outdoor exercise) and shopping trips are of highest importance to both men and women in this group. The study found that women wanted to undertake more of these trips than men, but were also often less able to do so. Another main finding of the study was that, after controlling for background demographic factors, lack of a driving licence and geographic inequalities in infrastructure were the most significant factors contributing to the poor mobility of different sub-groups within the sample. In many ways, therefore, the benefits of car ownership can be identified in direct relation to the accessibility problems people experience when they don't have regular access to private transport.

For example, the SEU study (SEU, 2003) identified that job seekers who can drive are twice as likely to secure a job in the first six months of their unemployment, than non-drivers. It also found that getting to hospital is particularly difficult for people who have to rely on public transport, leading to missed health appointments and associated delays in medical intervention; 31% of people without a car have difficulties travelling to hospital compared with 17% with a car. People without cars also find it more difficult to access healthy

affordable food and carry out social and leisure activities, a further contributing factor in determining health inequalities. These problems are particularly acute amongst non-car owning households in rural areas but are also prevalent in the urban periphery, particularly on social housing estates.

6. Car use, 'dependence' and 'dependency' culture

Given the huge economic and social benefits of car ownership and use, how have we moved in the literature from a widely held admiration for the car and all its attributes to a position where (in some texts at least) the car has adopted almost a demonised role? A first step to understanding this shift of focus in the literature has been to unpack the often confused and at times highly emotive language that has been used by various academic and policy commentators of people's car use behaviours.

The 1995 RAC Foundation report on car dependence (which is often identified within the UK literature as introducing this terminology) quite rightly points out that although many people depend on their cars for many regular journeys, this is far from the 'dependency culture' that is described by some of the theoretical and policy literatures. People are often reliant on their cars because of personal or external constraints that are largely outside their ability to affect, such as for disability reasons, or because there are no viable alternatives available to them or because they need to move heavy goods. The 1995 RAC Foundation report finds that:

'For many people, the word 'dependence' does not accurately describe their perception of how car use helps them to resolve these constraints. Rather, they see cars as providing independence, with concrete other advantages including the immediate convenience to make journeys without planning, real financial savings (and some illusionary ones), privacy from unpleasant people who might be using public transport, enjoyment of a feeling of control over choices affecting their daily lives and pleasure in performing active driving tasks'

RAC Foundation, 1995: 9

It is largely in the context of global environmental challenges or the local disamenities that arise from road traffic that writers have employed the language of *car dependence* to describe upward trends in traffic and car use. In their recent report for Transport for London (TfL), Steer Davies Gleave (SDG) (2005) describe car dependency as *a lifestyle* and find that once people have experienced the benefits of the car it will become ever more integrated into their lives. They suggest this is because the car works at many levels both functional and aesthetic, which in combination lead to it being largely used out of habit with little thought for any alternatives that might be available. However, they also find that it is not the actual car that most people are dependent on but rather what it delivers in the context of our time constrained, dispersed and highly security aware lifestyles.

In many ways Urry concurs with this assessment in his 2000 paper to the Unesco International Conference. He describes the car and what he terms *automobility* as a global icon of our times through which people gain considerable social status from its sign-values of speed, home, safety, career success, freedom, masculinity, genetic breeding and sexual desire. He also finds that it is only by 'inhabiting the car' that we are able to carry out the

multiple *socialities* of family life, community, leisure and work, which society now demands of us. This is because, what Freund (2003) refers to as the 'structure of auto space' effectively forces people to carry out their lives over much greater distances and more fragmented times and spaces than previously. This inter-connectedness between the car as both a function and symbol of modern life is well set out in Featherstone's introduction to the concept of *automobilities* (2004), which he describes as a term working off a *combination of autonomy and mobility* or *self-directed movement*. Autonomy is used here not only to refer to in terms of the driver's ability to search out the freedom of the open road but also in terms of a:

'... comforting protected and enclosed private space(s), increasingly a platform for communications media, that can be enjoyed alone or in the company of significant others. Not only an attractive marketing image in which cars are positioned traversing the wild parts of the planet such as deserts and mountain passes, but something which also speaks to powerful cultural dreams of adventure and freedom: the capacity to go anywhere, to move and dwell without asking permission, the self-directed life free from the surveillance of the authorities.'

Featherstone, 2004: 2

He notes, however, that there has been a shift in the way the car is constructed as a consumer object over time, identifying three main phases, each related to a particular theoretical model of consumption. The first phase (1900 – 1925), in the era of the large, specialist crafted, luxury car, they are seen as upper class status symbols in common with the then popular theories and models of class distinction (e.g. Marx and Weber). The second stage of thinking is during the era of mass consumption between 1925 and 1960, where the appearance of mass-produced cars fits with dominant theories of mass culture and pseudo-individuality arising out of the Frankfurt School at that time. The third phase from 1960 to the present, where the car is seen as a part of a fragmented series of subcultures in which a whole range of new types of vehicles emerge targeted towards small niche markets fit with the now popular postmodernist theories of explanation with their focus on identities, cultures and the signs and co-signs of media messaging.

It is within this latter phase that writers such as Urry and Featherstone set out their theories of *automobility* and describe the *hyper-mobility* of today's society as a culture of car dependency. An overview of these sociological texts identifies that in using this terminology they are primarily describing the spatial and temporal reorganisation of society around the car over time. This is what Kuhm (1997) refers to as a *spiral and self-organised process*, whereby the car becomes a structural prerequisite for the organisation of everyday life, while at the same time the variety of forms of everyday action becomes the structural prerequisite for the expansion of the car. From this point of view, it is society rather than the individual, which is locked into a culture of dependency, which Urry goes as far as to describe as:

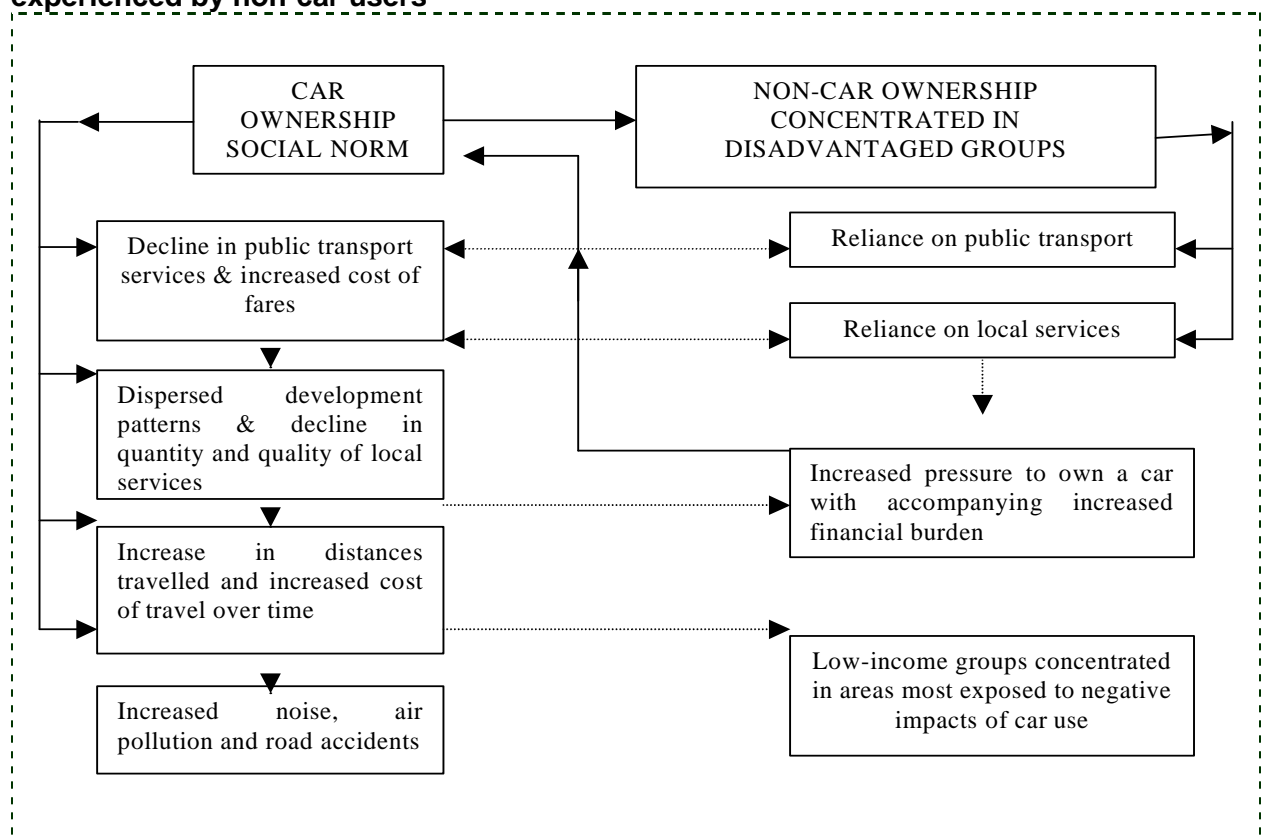
'... a Frankenstein-created monster, extending the individual into realms of freedom and flexibility whereby inhabiting the car can be positively viewed, but also constraining car 'users' to live their lives in spatially-stretched and time-compressed ways Automobility coerces people to juggle fragments of time in order to assemble complex, fragile and contingent patterns of social life, patterns that constitute self-created narratives of the reflexive self.'

Urry, 2000: 4

It difficult to assess from the literature, however, at what point people’s car use behaviours at the individual level can be described as merely a *perceived reliance* or when this reliance becomes an actual dependence or, indeed in extreme cases, may be considered to be an effective dependency or addiction to the car. It is clear from the literature that what is being described is actually a spectrum of behaviours and a huge degree of subtlety needs to be employed in determining whether an individual or household is genuinely car reliant or merely wedded to their car because of habits, social norms and other non-physical factors.

In his editorial to the Journal of Transport Policy in 1995, Goodwin recommends that there is a wide variation in how far people rely on their cars, as well as how they feel about this. He also suggests that this is best conceptualised as a distribution of differences in both journeys and individuals. At the one end are the journeys where the car is the only available mode or the individual is constrained from using another mode for reason of disability or load. Moving through the distribution we find situations where there is a lack of knowledge about the available alternatives or there are strong disadvantages of time or cost in using these. At the opposite end of the distribution are the situations where people are fully aware of the alternatives and could easily use them but actively resist doing so. In social marketing circles and socio-psychological models of behaviour change (see below) these people are generally referred to as the disengaged or *active refusers*.

Figure 1: Diagram to demonstrate the dynamics of diminishing accessibility experienced by non-car users



Source: Lucas et al, 2004: 16

Goodwin also identifies car dependence as a dynamic process operating at both the individual and societal level. Whilst individuals are prone to rely on their cars more and pay less attention to alternatives over time, social changes have also taken place to make car

use more necessary and the alternatives less attractive or convenient. This portrayal is repeated in a number of the literatures and is illustrated in diagrammatic form in Lucas *et al*, 2004 (see Figure 1).

In his study of the effect of land use strategies on automobile dependence in Boston, USA, Zhang (2006) identifies Newman and Kenworthy as the first to coin the phrase 'automobile dependence' in their 1989 manual *Cities and Automobile Dependence*. Their use of the term referred to the phenomenon of car-oriented land uses and the dominance of the car for urban travel in the context of US cities due to low-density sprawl. Several critics of their work have argued that it is not only low density sprawl but also income, petrol prices, levels of public transport subsidies and the availability of transport alternatives to the car. In particular, Brindle (1994) importantly argued that the extent of car usage should not be confused with car dependence '*which implies the absence of will or choice*' (p.129).

Zhang's paper offers a useful synopsis of the spectrum of ways in which car dependence has been used within the literature since Newman and Kenworthy. In his own empirical research he characterises automobile dependence in the context of an individual's choice of mode: a two-stage sequential process whereby a person considers the feasible choices available and then selects the best option from this choice set. However, Litman (1999) argues that current car use in the US is not an accurate reflection of consumer choice due to the numerous distortions and perverse incentives in the market, which effectively encourage excessive private vehicle use.

Also importantly, the 1995 RAC Foundation report distinguished between car dependent people and car-reliant trips. Initially, this distinction may seem pedantic; however, it raises an important issue, particular in the context of designing car restraint measures. A car-reliant trip is one where there is literally no viable alternative form of travel and the planned activity would have to be cancelled or postponed if there was no car available. A car reliant person suggests someone who would simply not be able to exist without that vehicle; quite a different implication altogether. Whilst very few people could accurately be described as car dependent in this way, a huge number of individuals and households in the UK do appear to have highly car dependent lifestyles; i.e. without their cars they would be severely disabled in carrying out their everyday activities such as getting to work, school or college, going shopping, carrying out their leisure pursuits or socialising with friends and family. In other words, lack of a car would seriously undermine their quality of life.

7. Locating car use within wider theories of individuals' decision-making processes

Our literature review helps to offer a better conceptual understanding of why these trends in travel behaviour are occurring and what motivates such behaviours at the individual, household and wider societal level. For example, in her 2005 paper, Anable identifies that motives such as pleasure, status and identity can be just as relevant as more traditionally identified factors, such as time and cost, in people's choice of the car as their preferred mode of travel. However, she also points to a number of studies which have suggested that much of people's daily travel mode choices are based on habit and not always preceded by the deliberation of alternatives (e.g. Verplanken *et al*, 1994; Gärling *et al*, 2000; Bamberg *et al.*, 2003). This suggests that in order to better understand people's car user behaviours, it

is appropriate to turn to the wide body of socio-psychological literature describing theories and models of how individual behaviours are formed, as well those attempting to identify the various processes and barriers involved in securing behaviour change.

Most commentators agree that the economic 'rational choice' model forms the starting point for a discussion of consumer behaviour. This contends that individuals make choices by calculating the best outcome for themselves based on cost/benefit calculations of different available courses of action. The model assumes that self-interest is the main driver of these decisions, that the consumer has all the relevant information with which to make a rational decision and that every such decision is made on the basis of cognitive deliberation. Economic theory is founded on the assumption that:

- Decisions are made in a stable state: our preferences are fixed;
- Individuals have access to all the relevant information bearing on the decision;
- Individuals are fully able to process this information in order to reach the optimal (utility maximising) decision.

Policy controls may be necessary, because individuals might not take into account wider social costs of their rational choices. Once such costs have been 'internalised' within the market they can be made visible to the purchaser and price equilibrium is maintained.

Arguably then, car use can be located within the theoretical literature as simply another form of rational consumer choice. In this sense, it merely facilitates us to improve individual and collective well-being by connecting us to the goods and services necessary to our everyday lives. However, we have already identified through the literature that the car also serves more than this simple utility function, feeding our social and psychological need as humans to belong and for our self-esteem and autonomy. The satisfaction of these needs might not always be achieved or in the longer term be in either our own (e.g. in the case of obesity) or society's (e.g. in the case of local air quality or noise) best interests and so do not fit with the utilitarian or 'rational man' model of understanding consumer behaviour. In this respect, car use behaviour matches other consumer behaviour, as identified by Jackson (2005) in his review *Motivating Sustainable Consumption*.

Here Jackson (2005) identifies two key lessons flowing from the literature;

- i) That material goods are important to us, not only for their functional uses, but for the huge symbolic role they play in our lives, and;
- ii) That far from being able to exercise deliberative choices about what we consume, most people most of the time are 'locked in' to their existing consumption patterns.

This lock-in occurs through economic and institutional constraints, inequalities of access and restricted choice, as well as their own personal habits, routines and expectations and wider social norms and cultural values. Jackson suggests that the development and use of conceptual models of behaviour and behaviour change can assist our understanding of what motivates consumer behaviours by firstly helping to identify the social and psychological influences associated with a particular behaviour and secondly allowing us to empirically test the strength of the relationship between certain influences and associated behavioural

outcomes. He warns, however, that models that are good for more heuristic understandings may not necessarily be good for empirical testing and vice versa.

Jackson is not the first and is unlikely to be the last to criticise the rational choice model of consumer behaviour, it has encountered considerable criticism over the years, from both within the economics discipline and more widely from social and psychological human behaviour theorists. It is not appropriate to re-rehearse the debate in the context of this review, however, a number of relevant recent synthesis reports offering an overview of the key issues are useful in this respect, most notably Jackson (2005) and Darnton (2004; 2006 and 2008). Anable and Kelay (2006) have also undertaken a similar review of theories and models from a transport and climate change perspective.

Jackson's review suggests there is a huge symbolic role of consumer goods as an essential feature of our society dating back to antiquity and that it is important not to underestimate the deeply rooted social and psychological factors that drive our behavioural decisions. To this end, generic socio-psychological models of human behaviour are useful to our understanding of why people make the choices they do, whether this is in relation to car use or any other public activity. Jackson recommends that some of these models, such as Ajzen's Theory of Planned behaviour (see Figure 2 below) are better at describing the internal preconditions for behaviours, such as values, attitudes and intentions, whilst others, such as Gateleben and Vlek's Needs, Opportunities Ability model (see Figure 3 below), focus more on external factors, such as the role of technology, economy, institutional constraints and culture.

Figure 2: Ajzen's Theory of Planned Behaviour (TPB), (1986) [reproduced from Jackson 2005]

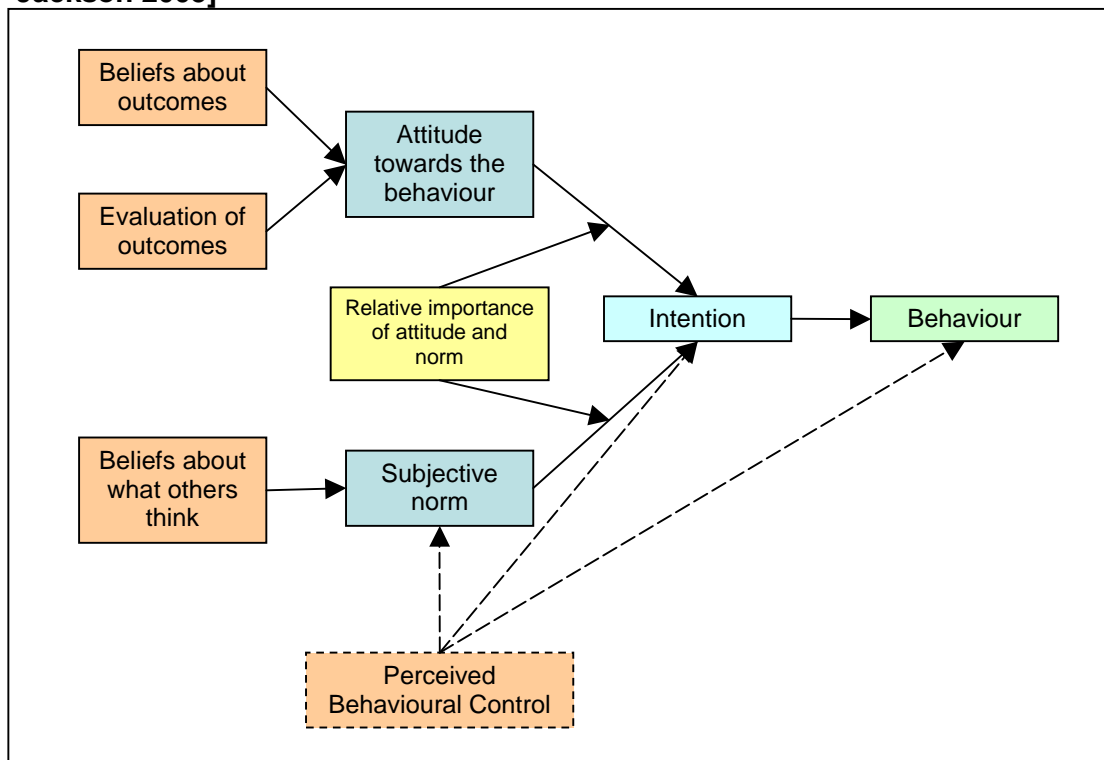
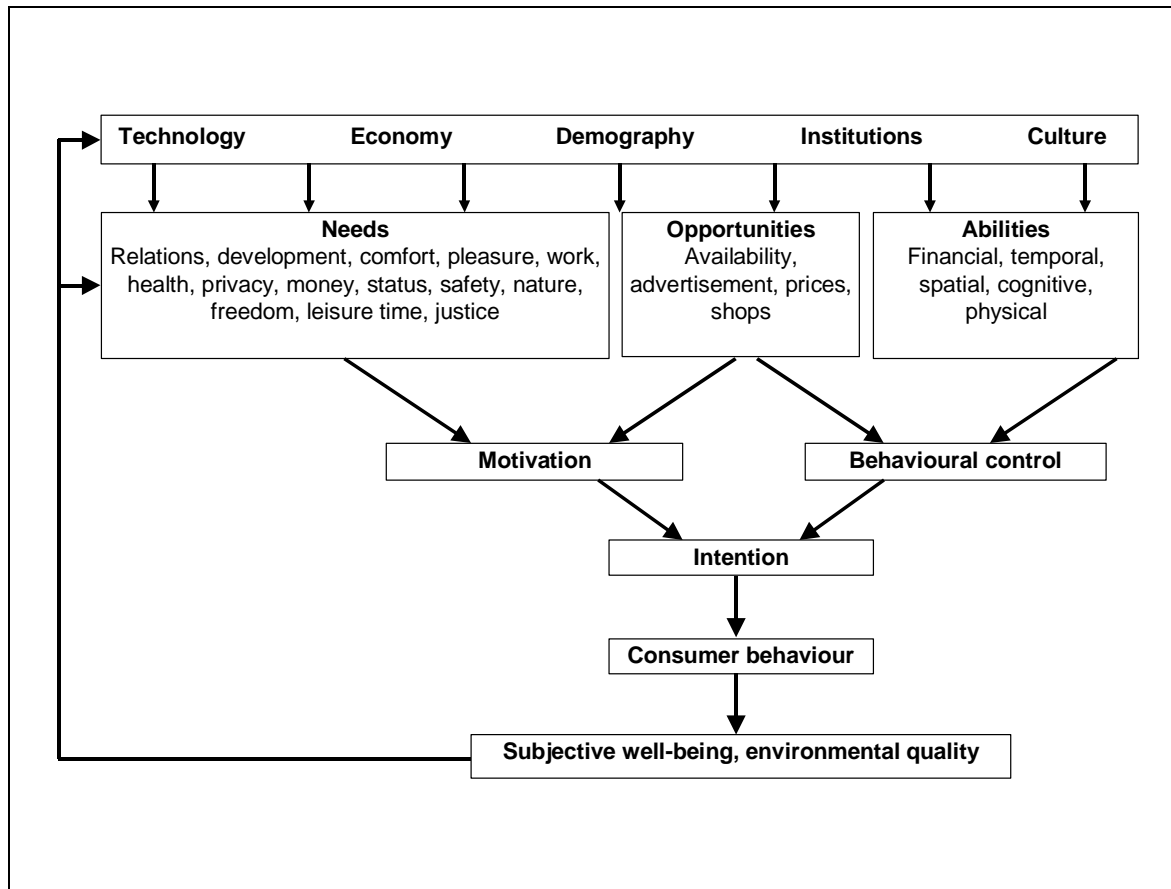


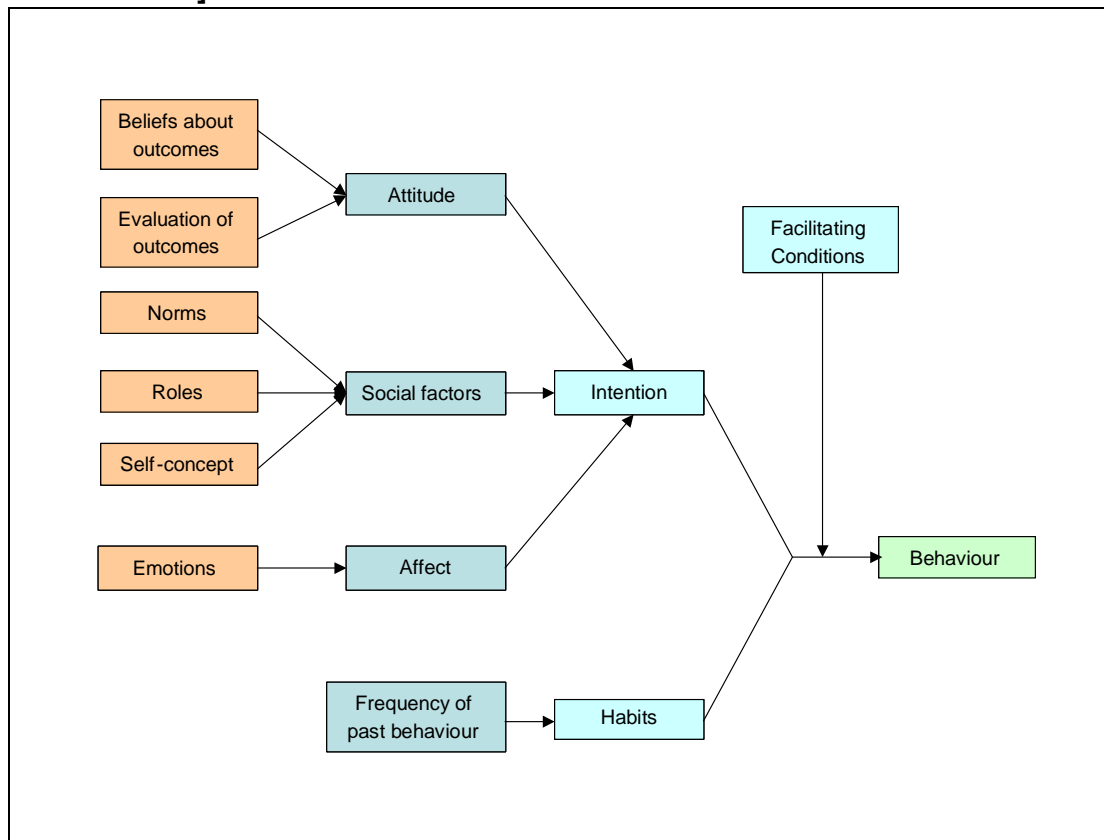
Figure 3: Gatersleben and Vlek's Needs Opportunities Abilities (NOA) Model (1998)



The distinction in approaches is important in debates about behaviour change because the former will tend to envisage this coming from changes in individual attitudes, values and beliefs, whereas the latter sees changes in external conditions as the primary catalyst of changes in people's behaviour. It is important to note, however, that even in models that primarily seek to explore the relative influence of different psychological aspects of personal control, such as Ajzen's Theory of Planned Behaviour, the importance of actual behavioural control in terms of physical and fiscal constraints is considered self-evident.

In common with Giddens's Structuration Theory (1994), Jackson recommends **an integrative approach** to theories of consumer behaviour, which can encapsulate both internal (action or agency) and external (structure) factors as the best way forward in determining behaviour change strategies (such as Triandis's Theory of Interpersonal Behaviour (TIB) (1977) see Figure 4). Equally important, it has been argued, there are the factors that feed our social-symbolic view of ourselves within society. The idea that material goods are also a part of the extended self and represent the way in which we wish to be seen by the rest of the world has also been evident in models of consumer behaviour.

Figure 4: Triandis' Theory of Interpersonal Behaviour (TIB), (1977) [reproduced from Jackson 2005]



Given these different theoretical and modelled representations of consumer behaviours, a key question is how can car use be usefully located and conceptualised within them? Is it simply a consumer behaviour, or as some of the previously reviewed literatures suggest something much more, contributing to the very basis of our self-image or a fundamental icon of our times? If it is *just another* consumer behaviour, is it constructed differently in some way from other similar behaviours? If much more than this, a dependency even, as some narrators have commented, then does it follow the pattern of other dependency behaviours? It is possible to identify a number of useful literatures in pursuing these various lines of enquiry.

8. Exploring the concept of 'dependence' in relation to other consumer items

In an attempt to get a better understanding of whether the language of 'dependence' has been extended to other areas of individual consumer behaviours and /or public policy control of these, the review briefly examined the wider non-transport literature with a particular emphasis on efforts to encourage behaviour change.

8.1 General theories of addiction

In his paper for Cancer Research UK, West defines 'addiction' as:

'...a social construct which can be usefully defined as a reward-seeking behaviour that has become 'out of control'. It can involve a wide range of abnormalities in the system of forces that energise and direct our actions - the 'motivational system'.'

West, 2006: 1

His 'synthetic theory' argues that addiction arises out of three types of abnormality, namely: i) in the motivational system independent of the behaviour in question, such as propensity to anxiety, depression and impulsiveness; ii) in the motivational system caused by the addictive behaviour, such as development of habits, withdrawal symptoms and acquired drives; and iii) in the physical and social environment that are conducive to the activity having an abnormally high priority. He argues that over time the human mind has developed to become inherently unstable to make us more creative and responsive to environmental contingencies and requires constant rebalancing to prevent the development of maladaptive patterns of thought and behaviour.

Perhaps more interestingly in relation to our study of car dependence, he suggests that addictive behaviours can often be successfully normalised by the same interventions that are commonly used to affect rational choice mechanisms, such as price rises. This is because, whilst 'disease models' of addiction take the view that addiction involves powerful and overpowering compulsions that are experienced as uncontrollable 'cravings', many of the other theories surrounding addictive behaviours describe it as a function of personal choice and judgement or as a reward seeking behaviour. From this point of view, addiction can be just as easily influenced via more generalised changes to the external environment as it can by directly treating the individual. The inference is that whether car dependence is conceptualised as pathology or addiction may be largely irrelevant in terms of the types of interventions it is appropriate to employ in seeking to influence it.

8.2 Fridge dependency

One UK review for the Food Climate Research Network (Garnett, 2007) refers to increased household reliance on the refrigerator in terms of a *dependence*. In a similar way to the car, the enormous benefits that refrigeration in the home has brought to people's lives is recognised, but its overall contribution to a higher than desirable personal energy quota in the context of the need to move towards a lower carbon economy is recognised. The report also similarly locates refrigeration dependency in the wider context of a number of post war societal and economic developments, such as the feminisation of the workforce and the consequential reorganisation of household shopping trends and subsequent growth of out-of-town shopping centres. Here, also, it is possible to see a complex reinforcement of these trends through other areas of lifestyle enhancement within the home, such as the introduction of central heating and the loss of larders and cool rooms. Changing food tastes and increased consumer choice within the food sector have also had a role to play, with an increased reliance in our everyday diets on processed foods and chilled drinks.

Here again, however, it is difficult to determine a difference in the language between the terms *reliance* and *dependence*. Perhaps one useful distinction the author appears to imply, although this is not specifically stated, is the essential role refrigeration takes in most contemporary households, such that it becomes indispensable, as the following quote illustrates:

'Refrigeration is now essential because the foods we now consume and the frequency with which we shop are predicated on refrigeration. In short, refrigeration has made itself indispensable.'

Garnett, 2007: 8

She also makes the distinction between the need to lower refrigeration energy use for environmental reasons through technical innovation and better food management practices and reducing refrigeration dependence itself, which would require *a change in our way of living and consuming*. The former approach places the policy emphasis on suppliers, whilst the latter requires policies to encourage households to change their food purchasing and eating behaviours. The author recommends that **both** will be equally necessary in the achievement of a lower energy future.

9. Understanding the factors influencing people's car use behaviours

In his synthesis review of the theories and models for pro-environmental behaviours, Darnton (2006) raises a number of useful general precautionary points in relation to the use of behavioural models, namely:

- Individuals' behaviours are complex; the more accurate a model is in terms of illustrating these complexities the more difficult it will be to operationalise and meaningfully interpret.
- Models attempt to split out complex behaviours into their contributory factors, and show the relationships between them, but even if the assumptions and observations informing them are correct, there can be procedural concerns about the validity of the attempt.
- Even at best, models generalise the behaviour of diverse individuals; when using models to develop policy it must be remembered that most people may broadly conform to a model, but they will not behave exactly as it shows.
- In order to operationalise models they need data from a particular study with a particular audience, there are limits to how meaningful a model will be if it is derived from one context and applied in a different one.

Nevertheless, there have been several important attempts to model car use behaviour, which can help to offer considerable insight into the myriad of interwoven influencing factors that contribute to car reliance and also demonstrate how this can cross over into a form of societal dependency. For example, Bamberg and Schmidt (2003) operationalised three different models of behaviour (Schwartz's Norm Activation Theory (1977), Ajzen's Theory of Planned Behaviour (TPB) (1991) and Triandis's Theory of Interpersonal Behaviour (TIB) (1977)) to assess which best explained the car use behaviours of university students when travelling to their campus in Boston, USA. These three models were selected because they consider controversial core issues raised within the psychology of behaviours literature, namely:

'Are proenvironmental behaviors mainly normative, moral behaviors (due to the norm activation model) or mainly guided by the calculation of personal utility and costs (theory of planned behavior)? Is the enactment of everyday environmentally relevant behavior mainly under conscious control (theory of planned behavior), or is it activated in a more automatic, habitualized fashion (theory of interpersonal behavior)?'

Bamberg and Schmidt, 2003: 266

9.1 The role of habit

Their headline finding is that Triandis's Theory of Interpersonal Behaviour (TIB) (see Figure 4 above) proved to be the best predictive model of car use. They thus concluded that habit – the key feature of the TIB model (or rather an habitual choice process that, although first rooted in initial considerations about pros and cons, then evolves into *routine-shaped automatic associations between stimulus situations and habitually chosen options*), proved more influential in determining the end behaviour of car use than even the *intention* to use a car (as determined by Ajzen's Theory of Planned Behaviour (see Figure 2 above)). In addition, the study found that 'role beliefs' (*what a type of individual like me should do*) were much more influential than 'subjective norms' (*what society says I should do*) in determining outcomes. The upshot of this analysis is that, for these university students at least, Schwartz's moral (including pro-environmental) principles did not have a significant impact.

On the basis of the findings of their applied research, the authors conclude that the role of habit in car use might help to account for why the public often fail to act upon consciously formed new intentions that may arise from new information or situations. This may explain the apparent widespread public resistance to information-based campaigns and other behaviour change interventions, which have been introduced by policy makers to change driver behaviours.

9.2 Intention and personal constraints

Partly in contradiction of Bamberg and Schmidt, in their meta-analyses of 23 unique datasets which measured car use behaviour and/or intentions, Gardner and Abraham (2008) found that in addition to habit, intention and personal behaviour constraint has a large effect on individuals' decisions on whether or not to drive. Their analysis thus largely endorses the Ajzen's TPB (1991), which suggests that behaviour is determined by intentions, which in turn inform attitudes based on a person's perception of the consequences of, and control over, their own actions.

However, they also suggest that:

'The emphasis of the TPB on rational agency may fail to adequately capture effects of habit on repeated car use decisions: unlike deliberative cognitions, habits refer to cue-response behaviour initiated outside of awareness [and that, therefore] future TPB applications might benefit from supplementing car use cognitions with measures relating to non-car travel.'

Gardner and Abraham, 2008: 8-9

The authors go on to suggest that people's reluctance to adopt alternative transport modes may result more from the perceived unattractiveness of alternative options than the appeal of the car. However, they also warn that car drivers may form negative attitudes towards these alternatives based on imperfect information about and/or lack of personal experience of them.

9.3 Availability of alternative travel choices

Consistent with this conclusion from Gardener and Abraham, a number of other reviews of behaviour change theory (e.g. Jackson, 2005 and Darnton 2004, 2006) have recommended that it is important to address external barriers to change before (or at the same time as) trying to influence the more difficult personal barriers such as people's habits, attitudes and social norms. Faber Maunsell examined this issue in a recent study for the DfT examining public perceptions of, and responses, to motorway congestion (Department for Transport, 2008). It found that the main initial reason respondents gave for continuing to use busy motorways was that there was normally no viable alternative for their journeys. On further discussion, however, it was established that this was not true and that public transport was available for many of these journeys, but that it was seen as less convenient and slower than using the car.

Generally, waiting in congested traffic was seen as more comfortable than waiting for a train/bus and drivers felt more in control. More confident drivers reported that they enjoyed driving even in congested conditions because there were often open stretches of motorway where they could pick up speed and enjoy the driving experience. Drivers also saw the benefits of time alone, safety and independence and enjoyed the lifestyle benefits of their cars. Nervous motorway drivers tended to be those with children and, although they said that they would prefer to use public transport, they didn't do so because of the difficulty of negotiating this when travelling with children, due to a lack of seating, storage and the cost of paying for more than one fare.

A study of 401 car owners living in Hong Kong, where public transport accounts for around 90% of all motorised journeys also seems to suggest that availability of viable alternatives does not reduce people's car reliance (Cullinane and Cullinane, 2003). Indeed, the study found the reverse to be true, in that once a car has been acquired, households become dependent on it, despite the existence of excellent public transport. Thirty-eight percent of respondents considered their car to be 'totally necessary' to their lifestyle and 46% 'quite necessary'. Only 15% stated that it was not very necessary. As the authors point out, however, the level of reliance is lower than was recorded in a similar UK survey by Lex Services (1995), which identified that around 80% of drivers recorded that they would find it difficult to make the lifestyle change to being without a car. This suggests that even in a country where public transport is by far the dominant mode and car ownership and use is highly constrained and expensive, the people who do own and drive cars very quickly become car dependent for most of their journeys.

9.4 The effect of moral motivation on habitual drivers

Eriksson *et al* (2007) have also explored the importance of habit in people's car use behaviours and in particular whether a moral motivation, such as environmental concern, might serve to over-ride this. In their study conducted in Sweden, they asked participants to

deliberate on the environmental impact of their car use to identify whether moral motivation could act as a trigger for behaviour change. The study found a larger reduction in car use amongst those with a stronger habit combined with a strong moral motivation to change. They concluded that the deliberative process had served to open up new travel options that had not been previously considered by these individuals. They note that there may be other (possibly stronger) motives for behaviour change than moral ones, such as a wish to save money or for a healthier lifestyle, which they did not explore in their study. They also highlight the importance of not only interrupting present habits, but also establishing new beneficial behaviours as an integral part of any intervention, if changes are to have any lasting effect.

9.5 Driver laziness and unwillingness to walk

With concerns about the negative impacts of short car journeys, not only on the local environment but also on people's physical fitness, Loukopoulos and Gärling (2005) looked at the extent to which aversion to physical exercise is a factor in people's car use choice for short trips. In a survey of six hundred employees taken from various levels of duties at Göteborg University, Sweden they found that regular and habitual drivers are more adverse to the physical exercise involved in walking than their less regular car using or non-driving counterparts.

9.6 Considering the responsiveness of different target audiences

The literature suggests that different population groups may be more susceptible to different types of interventions. Anable advises:

'The combination of instrumental, situational and psychological factors affecting travel choice will differ in distinct ways for distinct groups of people'

Anable, 2005: 66

This was borne out in a study of car commuters by Curtis and Headicar (1997), which aimed to identify who are likely to be the best targets for travel awareness campaigns marketing public transport or non-motorised modes. They identified that, while the vast majority of car users are not susceptible to such alternatives, a significant minority of males in their 30s who undertake short journeys to work of 5 miles or less are prepared to make the switch.

Their study focused solely on the journey to work and was conducted with 584 households living in five recently developed housing estates in Oxfordshire. This meant that the sample had more of a tendency than the average UK population to be white British, young, affluent and with at least one member of the household in employment. The journey to work also forms the greater proportion of total weekly distance travelled (76%) and adult householders are more likely to be car users (95% had full driving licenses and 61% had sole use of the car). Prior to the survey, the majority (625) had not considered changing mode and 73% indicated it was not practical to travel to work by any other mode. This allowed a crude four-way classification of the sample in terms of: i) those who had considered a mode change and for whom it was practicable to change; ii) those who had not considered a mode change but for whom it was practicable to change; iii) those who had considered a mode change but

for whom it was not practicable to change; iv) those who had not considered a mode change and for whom it was not practicable to change.

The study then noted some interesting differences between these four groups, in that older and younger people were less susceptible to change, as were part-time workers, most of whom were women. Distance to work was also a factor; with those travelling shorter distances being more willing to change than those with higher mileage commutes. Company car owners and drivers with sole use of a car were also less likely to want to change. There were also some striking similarities, in that these susceptibility factors appeared to hold across income variability (although this may not have been as marked due to the nature of the sample). Women in full-time work were also undifferentiated from men in full-time work. Free car parking also did not appear to have any influence on outcome. One of the main reasons cited in the survey for not using non-car modes was concern about the public transport system (31% of the sample).

9.7 The effect of increased motoring costs

The effect of increased cost on people's car use behaviours was partly examined in a study by Gray *et al* (2001) assessing the likely impact of increases in the fuel duty escalator (which was introduced in the UK in 1992 and subsequently dropped in 1999) on rural communities in Scotland. The study aimed to demonstrate the importance of income and isolation on car use in Scotland and to distinguish between households that are structurally dependent from those that rely on them through choice. A variety of research methods and data sources were used for the study, including a postal survey, travel diaries and interviews and a series of focus group discussions with different population groups in the five study areas.

The survey demonstrated high levels of car ownership (89% of households had access to a car) and use (accounting for around three quarters of all journeys) across the sample. The study established that to rural dwellers in Scotland the car represents a fundamental part of the domestic economy and is seen as essential as paying the mortgage. There is a direct link between affluence and mobility; greater income equates with more cars in households and more journeys of longer distances. Low-income households with less capital tend to own smaller and older cars and make considerable sacrifices to keep a car on the road. Income and isolation were also identified as strong determinants in predicting households whose car ownership has decreased. People who lived or had moved closer to services were more likely to give up a car than those living on equivalent incomes but living more remotely.

The authors conclude that in the short to mid-term increases in motoring costs will have a modest impact on a sizeable number of households in rural Scotland, but for many it will be moderated by relative affluence, short travel distances and their relatively good proximity to shops and local services. However, for more isolated rural dwellers with incomes below £15,000, who already spend a significant proportion of their income on fuel, the impact will be more severe and may act to exclude an increasing number from society. The study advises that long distance commuters are also likely to be more adversely affected and for them, fundamental lifestyle changes may be needed, including seeking new employment or relocation.

9.8 Summary of the factors

What can we conclude from the synthesis of these various exploratory studies of car users perceptions and attitudes towards change? What motivates people's travel behaviour? Is it habitual, necessary, normative or pathological? Should we be trying to encourage people out of their cars at all or will this be likely to have such a fundamentally detrimental effect on their lifestyles that it is simply not possible for people to give up their cars without considerably compromising their economic and social well-being? If it is necessary for people to reduce their car use, then how can this be best achieved? Who should we be targeting and how? What might be the equity effects of such actions and how do we ameliorate the negative impacts of these on the most vulnerable or least adaptive groups?

In their summary report on developing better policies to influence pro-environmental behaviours, Darnton *et al* (2006) note that there are many factors impacting on individuals' behaviours from organisational and societal levels, which may prevent change from occurring. The factors influencing people's consumer behaviours are numerous, highly complex and non-linear. They also identify that different audiences behave differently and are often motivated by different factors. This is particularly true of people's car use behaviour, as has been demonstrated by this review thus far.

In his 2005 review, Jackson concludes that while some consumer behaviours are clearly motivated by rational self-interest and individualistic concerns, the rhetoric of consumer sovereignty is largely inaccurate. This is because on the one hand it fails to appreciate the social and psychological influences on individual behaviour and secondly because it fails to recognise the way in which a general absence of real consumer choice within the market serves to 'lock-in' our consumption patterns. He suggests that if Government is serious about motivating more sustainable patterns of consumption it must adopt a more creative and holistic approach in its associated policies.

Whilst models, theories and attitudinal surveys can help to inform policy-makers about the most effective ways to reduce individuals' or households' car use, they are often inaccurate in their predictions of how people actually behave in practice in response to car use reduction measures. To this end, it is important to also consider the literature describing evaluations of car reduction measures and it is to this we now turn.

10. Reducing reliance on the car

There has been a sizeable body of research in the UK over the past decade or so evaluating the effectiveness of a variety of policy interventions designed to reduce car dependence. Some of these are briefly reviewed below, but this is only intended to offer a general outline of the key policy drivers of change and should not be seen as comprehensive in this respect.

10.1 Supply-side measures

Significantly increasing the capacity of the road network has been significantly downsized as a solution to congestion in recent years, following the much-publicised 1999 SACTRA report, which suggested that this simply leads to increases in traffic volumes to fill the available space. However, in a recent report for the RAC Foundation entitled *Roads and Reality*,

Banks *et al* (2008) suggest that this approach should be rethought and that a combination of road-building and road pricing is the only way out of the current congestion problems in the UK. Their study finds a good economic case for a programme of strategic road building in Great Britain at an annual rate of around 600 lane kilometres a year or more, whether or not road pricing is introduced. They recommend that this additional capacity can be largely provided by widening existing roads, but that some completely new roads would also be needed to reflect changes in location of population and economic activity.

The authors do recognise that this additional road capacity could fill up, but they express the view that these increases in the level of overall traffic would be more than compensated for by the economic benefits that increased traffic activity brings. They also argue that the introduction of road pricing would serve to ensure that these benefits were maximised and if introduced together road pricing and road building, would allow fairer access to the road network. However, it is also recognised that it is possible that road pricing might bring about some social inequities.

10.2 Fiscal constraints and incentives

The UK Fuel Tax Escalator on petrol is probably the most widely recognised form of car user charging. It was introduced in 1993 when British fuel was among the cheapest in Europe, but since then, rates of fuel taxation have increased rapidly and there has been widespread protest at times regarding oil price increases, as at the present time. Partly as a result of its unpopularity with the public and partly due to the apparent ineffectiveness of these increased costs in terms of reducing the number of cars on the road (in fact this increased by 11% during the 1990s), the UK Government appears to have abandoned fuel taxation as a car reduction strategy in recent years (Prendergrast *et al*, 2008).

Interest in various forms of road user charging appears to be increasing, the most notable scheme of this kind being the central London Congestion Charge, which was successfully introduced in February 2003. Initially there was a sharp reduction in vehicles entering the congestion zone, with decreases of around 25% in the first few days, but by 2006, a report by Transport for London (in early 2007) indicated that there were 2.27 traffic delays per kilometre in the original charging zone, compared with a figure of 2.3 before the introduction of the charge (*ibid*).

December 2003 also saw the opening of the M6 toll road, which was built to alleviate congestion around the city of Birmingham, but again, trends indicate that these charges are not necessarily deterring motorists. There is also an issue of negative social equity associated with such charging, which has not been adequately researched. For example, the Institute of Fiscal Studies estimated that a doubling of fuel duty would, theoretically, result in a reduction in car mileage of 47% amongst job seekers (although in practice such a reduction could probably not occur due to their already low car usage).

In a US 1992 study of over 1,000 solo-drivers employed in Orange County, Baldassare *et al* (1998) reported that employees were twice as likely to respond to financial and provisional incentives to change their behaviours than to charges. One in three said that they would respond positively to incentives from their employers, one in three would respond positively to the provision of a car or van pool and four in ten said they would switch to public transit

were it made more available, whilst only one in six would respond to a charge fee attached to their solo-driving.

10.3 Providing travel alternatives

In his paper to the PTRC Annual Conference in 1997, Buchanan *et al* undertook an analysis of the potential of alternative modes to significantly reduce car use. They recommended that new buses and trains could definitely have a greater part to play in transporting people to town centres and major attractions in the UK, but these are currently uncompetitive with the car for reasons of slower speeds, inappropriate routing and lack of door-to-door convenience. They estimate that walking and cycling can, at best, only account for a switch in 20% of car journeys under 5 miles.

Adams (1997), on the other hand, challenges the view that improvements to public transport would necessarily affect people's car use. He argues that most of the growth in car traffic has taken place in the context of a public transport system that was better, cheaper and more pervasive than it currently is and with a land use system that was more accessible to non-car users than now. Nevertheless he argues, as with now, once people had acquired a car they used it for most trips. He takes this as evidence that more and better public transport will not be sufficient to get people to leave their cars at home. Stopher (2004) also concludes that 'hard' infra-structural initiatives alone seem to have failed to deliver the shifts from car use that were hoped for and expected, despite huge financial investments.

His assertion seems to be borne out by the few comprehensive impact studies of major new transport projects outside of central London such as the Manchester Metro, the Sheffield Supertram and the Croydon Tramlink. These show that most often the people using these new services have shifted from slower modes rather than transferred out of cars. This criticism led Adams to conclude that a package of tailored measures is needed to reduce people's car use including a combination of on-street car hire schemes, taxi and public transport discounts, improved information, same day delivery and expanded doorstep services and traffic calming measures. The introduction of a set of comprehensive measures such as these has never been put into practice here in the UK or elsewhere, so it is difficult to assess whether Adams assertion is correct.

10.4 Travel awareness campaigns

There is growing policy interest in the use of 'softer' measures, such as travel awareness campaigns, personalised and work placed travel planning and social marketing techniques for influencing people's travel behaviours (Bamberg and Moser, 2007). Cairns *et al* (2004) estimate that in the UK a consistent implementation of comprehensive soft-policy programs may result in a reduction of the total traffic up to 11%. However, based on their meta-analysis of the work place travel plans reviewed in the Cairns study, Bamberg and Moser question the reliability of the narrative approach that was used by this study and disagree with some of its findings and recommendations on this basis.

In a Japanese study, Taniguchi *et al* (2003) undertook a Travel Feedback Programme with 219 households in the city of Sapporo. The information kit included a pamphlet outlining the intended behaviour change programme for car use reduction, travel diaries, diagnostic checklists with feedback to respondents on their behaviours and a second diagnostic

checklist to monitor continued behaviour changes after 1 year. In the short-term, the researchers found that the household share of car trips had reduced by 5%, whilst their use of public transport had increased by 4%. In a follow-up survey one year later, they had continued to promote this pro-environment travel behaviour, although, perhaps surprisingly, this did not spill over into wider environmental awareness-raising or positive moral intentions towards the environment amongst the target group.

Conversely, in a study of the effect of tailored travel awareness information and advice to 350 car users in the Gouda region of the Netherlands, Tertoolen *et al* (1998) found participants to be highly resistant to behaviour change. By random selection, participants were assigned to one of five treatments (one being a control group). The first group were told about the environmental effects of car use, the second about its financial costs, the third were provided with both pieces of information and the fourth with neither. Respondents were approached several times over an eight week period and represented with the information treatments. They recorded all their trips over this period and were given feedback in relation to this every two weeks.

The research found that none of the treatments had any significant effect on their driving behaviours, although, interestingly, providing information about the cost of motoring appeared to decrease the role of cost considerations in the participants' travel making decisions. The authors assume that this relates to a motivational need the participants had to re-establish their freedom and independence in the light of the negative information they received about their behaviour. The environmental materials raised awareness generally, but not of the respondents' own part in contributing to pollution, even those it was pointed out to them in a face to face discussion. All results were controlled for the effects of age, gender, commitment to reduce mileage and presence of a catalytic converter. The researchers conclude that information about the environment will only change driver behaviour if a) mode switching is not disadvantageous for the individual; b) valid social norms are positive towards environmentally friendly behaviour; and c) sufficient opportunities to undertake this alternative behaviour are present.

This conclusion seems to be borne out in a study of Schopfheim in Germany which was undertaken between 1994 and 1996. The study combined awareness-raising information with motivational activities, such as setting up car pools, bicycle schemes and providing opportunities to try out public transport (Meyer-Ruhle, 1997). The study reported a drop in the number of car trips as the driver over this period for all days of the week of between 3.2 – 2.6% depending on the day. The share of bike riding rose by nearly 6% during the week and over 8% at weekends. The strong involvement of the local community in the introduction of these measures was seen as a positive contributing factor in this outcome.

Gardner and Abraham (2008) identify a growing literature which also testifies to the effectiveness of policy measures that target car use reduction via psychological change, such as personalised travel planning and travel awareness campaigns. However, they find that it remains largely unclear which (if any) cognitive antecedents of driving are targeted by these policy measures, and on what basis behaviour change techniques are chosen. They suggest that possibly the most significant finding of their study is the lack of available evidence about precisely what does and doesn't work in policy terms to achieve reduced reliance on the car, or encourage modal shift or other behavioural changes associated with car use.

10.5 Land use planning

There is no doubt that the land use planning policies that have been incrementally introduced since 1994 in the UK to encourage development to support existing town centres and to make best use of the public transport network have served to reduce out-of-town development and produced more transit aware development. Simultaneously, both planners and public health practitioners have been promoting policies to encourage improvements to the built environment in favour of pedestrians and cyclists.

However, Cao *et al* (2006) question whether these policies have been truly effective and there is no hard evidence from the UK travel statistics that this has had any impact on the number or length of the trips people make (Buchanan *et al*, 1997). In the conclusion of his paper to accompany his professorial lecture, Stradling (2002) finds that our built environment both maintains and reproduces continued use of the car. Cao *et al* identify several empirical studies in the US which suggest there is a correlation between the built environment and pedestrian behaviour in terms of both land mix and sidewalk connectivity but question the underlying causal relationships behind this. They suggest that the connection may be more a matter of residential location choice and prior self-selection into a walking area than an actual day-to-day travel choice.

Similarly there has been a suggestion by a number of academics (e.g. Newman and Kenworthy) that higher densities are associated with less travel, but as Stead identifies in his 2001 paper, this could be a consequence of the variation in income with density or some other socioeconomic characteristic, rather than the effect of land use per se. In his multiple regression analysis of data from four UK National Travel Survey (1978/79, 1985/86, 1989/91 and 1991/93) at the individual and ward level, he found substantial variations in travel distance according to individual characteristics, including gender, age, work status, and the possession of a driving licence, as well as links between a number of household characteristics and travel distance, including socioeconomic group, car ownership, and household composition. In terms of the impact of land-use characteristics on travel distance, only ward population density emerges as having a consistent and significant effect on travel distance per person. Since 1985/86, however, he also found that residents of low-density wards (with fewer than 10 persons per hectare) travel longer distances than residents of most other wards. In the 1991/93 residents of areas with lower bus frequencies travelled more than residents of areas with higher bus frequencies. He also found that other land-use characteristics such as settlement size, the proximity to local facilities (post office, chemist, and grocers), the distance to high street shops, the proximity to a bus stop or railway station, and local authority population density have a smaller, less consistent or unclear effect on travel distance per person.

10.6 Focusing on the positive health aspects of walking and cycling

Physical activity is seen as a major factor in determining people's health outcomes. Even at moderate levels, physical activity reduces the risk of premature mortality and the development of chronic diseases, improves psychological well-being and helps prevent weight gain and obesity. For this reason, health practitioners have increasingly become advocates of, and willing partners, in initiatives to promote walking and cycling. However,

the relationship between the built environment and physical activity is complex and inconclusive, as previously noted.

A 2005 Transportation Research Board/Institute of Medicine report specifically focusing on this issue concluded that the empirical evidence demonstrates an association between the built environment and physical activity, but found that few studies were capable of demonstrating a causal relationship between specific attributes of the built environment and people's propensity to be physically active within it. It found that factors such as access, safety and security appear to be important for some forms of physical activity, such as walking and cycling, but the evidence from preliminary studies is not definitive. It concludes that more collaborative trans-disciplinary studies by health and transport researchers would be useful in this respect. However, the review was wholly focused on US studies, which could arguably be considered to be non-applicable to the UK.

A more recent synthesis of the UK evidence was published by the National Institute for Health and Clinical Excellence (NICE) in 2008. It recommends that:

'The design and layout of towns and cities can encourage or discourage travel and access on foot or by bicycle. Similarly, building location and design can encourage (or discourage) the use of stairs and other physical activities. These modifications can be achieved by public sector agencies working in partnership with other organisations, including those in the voluntary and community sectors.'

National Institute for Health and Clinical Excellence, 2008: 15

It also recommends that safety is a key issue and that environments need to be considered welcome, attractive, interesting and inspirational.

Despite its extensive coverage, however, (the systematic review included detailed consideration of 54 empirical studies of whether environmental change had altered people's physical activity levels out of a potential 94,172) it was difficult to ascertain to what extent the interventions under examination were responsible for the changes seen. This was largely because of methodological weaknesses in the studies themselves, such as lack of a comparator study area or population groups; 'before' data collection; appropriate measures of activity or; consideration of causal factors. Most often, the studies were not undertaken by health professionals and the evidence gathered, such as the number of increased walking trips or numbers of users of an initiative, could not be translated into physical activity levels.

10.7 Focusing on the negative impacts of car use on climate change

In recent years, policy makers have increasingly sought to influence people's car-based travel by focusing on its negative impacts on the environment and specifically in relation to climate change. To this end, the Department for Transport commissioned an evidence review of public attitudes to climate change and its influence on travel behaviours (Anable *et al*, 2006). The review aimed to capture all aspects of travel, including the choice of all transport modes, car purchasing, the frequency and amount of travel and support for transport policies, but found a paucity of evidence relating to air travel and climate change.

The review found that currently there is only a weak link between knowledge and awareness of climate change and people's travel behaviour. This is largely because public knowledge and awareness of this issue is still quite poor in general and, in particular, in relation to the translation of macro-level information about climate change to people's own personal micro-activities and lifestyles. For this reason, the key recommendation arising from the study was that the public need to be engaged in issues of transport and climate change using more community-based, iterative and innovative methods, such as Community Social Marketing to persuade people out of their cars. However, it also recommended that public support for climate change policy would not be sufficient on its own to change people's travel behaviour and that many other factors will also need to be addressed. In order to effect change, many other factors need to be addressed at the objective and subjective and individual and collective levels. It also recommended that these factors will be different for different population groups, areas and types of travel and in different circumstances.

10.8 Targeting different market segments

Recent research by Anable (2005) suggests that segmenting car users according to their psychological motivations might prove to be a highly effective way to encourage changes in their travel choices. In a survey of 666 visitors to National Trust properties in the North West of England, she utilised psychometric data and factor and cluster analysis to determine six relatively stable sub-groups or market segments of visitor; four car owning and two non-car owning. She found that the four car owning segments displayed distinct differences in the ways in which they expressed their psychological attachment to the car.

Malcontented Motorists perceived a high number of constraints to their use of public transport despite being increasingly frustrated with driving, whilst the *Complacent Car Addicts* admitted that its use was possible but that they do not feel any moral imperative to use it. Conversely, *Aspiring Environmentalists* had already considerably reduced their car use for environmental or health reasons but were reluctant to give up their cars entirely for reasons of convenience. The *Die Hard* car drivers like both their cars and car travel, believe in the freedom to drive cheaply and have negative feelings towards all other modes. In the non-car owning groups, *Carless Crusaders* have voluntarily given up their cars for the sake of the environment or their health, whilst *Reluctant Riders* use public transport only because they cannot afford to drive or cannot drive for reasons of ill-health and accept lifts from others whenever possible.

Anable concludes that whilst information about the negative environmental or ill-health effects of car use will usually be insufficient to change people's car use behaviour, understanding car drivers' underlying motivations will help policy-makers to better target their messages about the need to reduce car use. For example, reminding *Malcontented Motorists* about the frustrations of driving and the relaxing qualities of public transport may prove the most effective message, whilst *Aspiring Environmentalist* are likely to be more responsive to reminder messages about the availability of alternative 'green' options, such as local bike hire schemes.

10.9 Summary of the effectiveness of measures to reduce car reliance

There has been a huge explosion in both the published and 'grey' literature in the area of policy interventions to reduce car use over the last ten years or so, but robust empirical evidence of what actually works in terms of reducing car reliance is still extremely limited. In many instances, this is because many of the initiatives that have been instigated for this purpose in the UK have been applied at the micro-level by local authorities and other agencies in a very fragmented and piecemeal way and have tended not to include full formal evaluation of project outcomes.

The evidence which does exist suggests that people's car use behaviours are highly intractable and will require a concerted, consistent and comprehensive approach over a protracted period of time, if they are to be successfully influenced. Measures will need to employ the full range of supply and demand-side market interventions at the individual, community and whole systems level. Improved public awareness of the negative health or environmental outcomes of personal and societal car reliance will usually be insufficient to change people's car use behaviours.

More general socio-psychological models of people's decision-making across a wide range of different consumer behaviours suggest that it is necessary to first address external barriers to behaviour change such as the physical supply or cost of services before attempting to address the more difficult to influence social attitudes and norms. Empirical studies have also found that people are more likely to respond positively to financial incentives than to charges. Information and travel awareness campaigns are more likely to achieve success if they are delivered using personalised and targeted social marketing or through deliberative and iterative community-based programmes and when they are accompanied by supporting physical opportunities and new provisions for change.

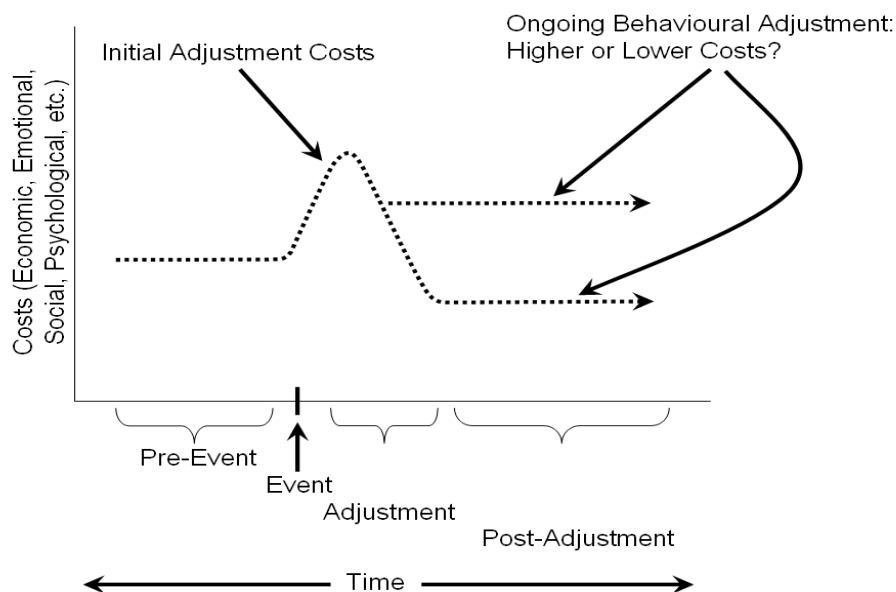
11. Understanding the cost of adjustment of car use reduction measures

This final section of the paper considers the evidence for the likely impacts on individual lifestyles and livelihoods in response to a significant level of reduced car use over an extended period of time (or permanently), as well as the possible economic and social outcomes of this for society as a whole.

11.1 Conceptual models of responding to involuntary behavioural change

We began by exploring the literature for prior research on processes of behavioural disruption and subsequent adjustment. Figure 5 shows a conceptual model of how the costs a person or household bears are affected by a disruptive event such as an involuntary reduction in car usage. It can be seen that costs rise immediately following the event as the person considers coping strategies and an initial adjustment in behaviour is undertaken. At this point in time behaviour is in a state of flux. In the transport context, research has found that "*individuals and employers express great creativity in arranging alternative transport*" in response to, for instance, a transit strike (Van Exel and Rietveld 2001). In this initial adjustment stage, the person incurs more costs than previously, as they seek to accommodate the post-disruption reality.

Figure 5: Conceptual model of responding to involuntary behavioural change



These costs may be both tangible and intangible, such as time and energy spent in the adjustment process that one otherwise might spend at leisure, meeting social obligations, or in paid work. During this period of flux, costs have unambiguously risen above pre-event levels. As noted by Gärling et al. (2000), the context is one of *tolerance-seeking*, rather than *preference-seeking*, which Kahneman and Tversky (1979) identify as psychologically different processes. Gärling et al. (2002) indicates that a starting point for considering adaptation to a scenario is that “*people in general want to preserve the status quo [following a disruption], or if this is not possible, to make as small changes as possible.*” Loukopoulos et al. (2004) formalise this concept into the *cost-minimisation principle* of responses to cost of reduction scenarios, which states that “*...people prefer to achieve their [cost of reduction] goals at minimal cost.*”

Though the sequential models of psychosocial adjustment are well-known – such as the classical Kübler-Ross model of denial, bargaining, anger, despair, and acceptance – contemporary psychology considers adjustment as an iterative process (Kübler-Ross 1969). Research into people’s coping with an acquired disability describes such a conceptual model for the adjustment process:

‘The recurrent nature of adjustment originates from the fact that new schemas [schemas: fundamental beliefs and assumptions about the self, others and how the environment works] will be developed incrementally and will be revised, modified or completely restructured as the individual consolidates his or her new position in life and has opportunities to explore the environment...the process of adjustment is likely to occur in an iterative manner...’

‘Although not necessarily a universal phenomenon, individuals...are likely to continue moving through a series of continually decreasing pendulum swings while they establish their new schemas.’ (Kendall 1998)

Following the period of initial adjustment, then, the person or household tends towards a new equilibrium which may involve either higher or lower ongoing costs. Groupings of costs in the cost of reduction scenario would include:

1. Costs of seeking information, considering alternatives, and other “search” costs as one must make more complex activity-travel choices
2. Costs of accepting the second-best elements of one’s revised activity-travel pattern since car use is constrained
3. Costs of adapting the public and private infrastructure stock to adjust to new activity-travel patterns

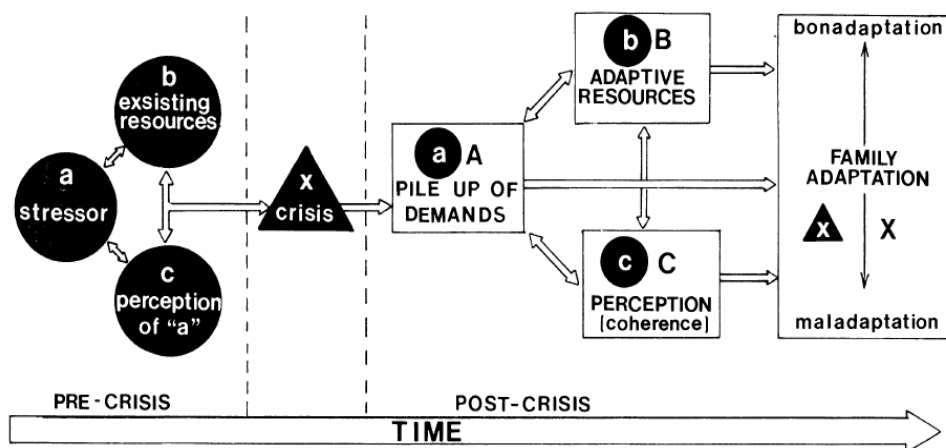
At first glance we may expect that the ongoing adjustment costs following a cost of reduction scenario will be necessarily higher than those pre-event. Travel, being in general a *derived demand*, is for the most part undertaken to serve the positive valuation that one places on their personal activities. Disruption to people’s personal activity choices – and how/whether they are accessed – would be expected to exact costs on the individual.

The concept of *travel burden*, though, has been put forward as a way in which a cost of reduction scenario might result in lower ongoing costs. By considering travel to be an encumbrance, this is a possible mechanism which might conceivably have the effect of lowering ongoing costs in a cost of reduction scenario. Another conceivable cost-saving mechanism would be savings on maintenance of road infrastructure and the automobile stock. These seem unlikely to be larger in magnitude than the cost-increasing effects, however without prior knowledge it is an open research question whether ongoing costs might rise or fall relative to beforehand. With respect to the notion of travel burden, to the extent that people are *utility-maximising agents* we travel only if the perceived benefits outweigh the costs. There is, however, evidence in the literature of people’s behaviour not matching the paradigm of *homo economicus* [economic man], at least in the short-term. These circumstances of *bounded rationality* are hypothesised to occur for many reasons, amongst them people’s imperfect ability to forecast future preferences, risk avoidance, and use of decision-making heuristics. (Kahneman 2002) We revisit this issue in light of the empirical evidence in Section 5 below.

Regardless of cost bookkeeping, it is clear that a person’s response to a disruptive event will depend on the interaction between attributes of the disruption and characteristics of the person (and more broadly their family, as discussed below). The heterogeneity of how families respond to crises is formalised in the classical conceptual model known as the *ABC-X* formulation, which has been used by researchers to explore the effects of such life shocks as bereavement, unemployment, alcoholism, and war separation (Hill 1949, 1958):

Figure 6: The ABC-X formulation of response to a disruptive event

- **A**, (the stressor event) interacting with
- **B**, (the family’s crisis-meeting resources) interacting with
- **C**, (the definition the family makes of the event) to produce
- **X**. (the crisis)



Source: Lavee et al 1985: p.812

The ABC-X model has since been extended into a form known as the *Double ABC-X* (shown at left) (Lavee et al. 1985). The key distinction with the earlier ABC-X form is that pre-crisis variables are refined and the post-crisis variables are added. It explicitly recognises the effect of a crisis event interacting with other stressors (the aA “pile-up” element). Essentially, the A→B→C→X form is repeated post-crisis with the end-result being the degree of success (or otherwise) of the family’s post-crisis adaptation.¹ Following application of the conceptual model within the context of war-separated families, McCubbin and colleagues identified that:

...families appeared to go through three stages of adaptation which we have called resistance, restructuring, and adaptation.

(McCubbin et al. 1983)

11.2 Circumstances analogous to non-marginal car use reduction

A number of situations have arisen in recent years which are similar to a cost of reduction scenario in at least some respects. In developing a list of such circumstances, we cast a wide net to consider disruptions to systems which enable basic social and economic day-to-day behaviour, both travel-related and otherwise. Hence, for instance, we considered the impacts of Argentina’s economic crisis, during which the *peso* lost most of its value and GDP decreased year-on-year for 4 years (Fizsbein 2002). In the discussion, we explore both the parallels and contrasts of the various situations with the prospective cost of reduction scenario.

The matrix below summarises events for which literature on the disruptive effects is available, with the right-most column describing the attributes of the hypothetical cost of reduction scenario on which this research is focused. The appendix contains a summary table of datasets gathered in the various situations. Many of the situations have timescales measured in terms of weeks or less. Disruptions of relatively short-term timescales can be expected – and have been found – to elicit different coping strategies than those of longer or permanent duration (Coindet 1998). Likewise, the advance knowledge of a disruptive event [and its duration] provides an opportunity to pre-plan behavioural responses, which allows

¹ Graphic reproduced from (Lavee et al. 1985), Figure 1

people a broader range of choices than when coping with an unexpected disruption. While we may expect that there would be an extensive public debate in advance of a cost of reduction scenario, it is not the only plausible eventuality. One can envision a situation whereby an unforeseen supply shock is followed by measures to maintain the modified state of the system. An example occurred following the 9/11 terrorist attack on New York City. Access to lower Manhattan was initially restricted to vehicles with multiple occupants, and the subsequent lifting of these restrictions was met with calls to maintain the restrictions on a permanent basis (TSTC 2003).

Many of the travel-related disruptions involve significant operational changes to the transport network's functioning. The closure of arterial highways following the Northridge/Osaka-Kobe earthquakes and the transit network disruption during the Paris strike were different types of supply shocks to the transportation system. In a planned cost of reduction scenario, however, our *a priori* expectation is that the reduction in traffic levels will reduce car travel time and increase reliability for residual driving trips.

The extent of the disruption is another important attribute. We considered the situation where one has suffered an acquired disability, for which there is a body of literature (Oswald and Powdthavee 2008). In such an event, the stricken individual and their family must make behavioural changes on the basis of a permanent change in circumstances – similar to the hypothetical cost of reduction scenario. However, as seen in the ABC-X family of coping models, the ability to draw on family and other social resources is a key determinant of successful coping. A critical distinction with the cost of reduction, therefore, is that a broad cross-section of society would find itself making travel-activity lifestyle adjustments simultaneously. We may hypothesise that this would affect the coping resources available to people, although whether social resources would be more or less accessible is ambiguous. On the one hand, individuals undergoing adjustment may be less able to support others in the same position. But conversely, it is quite plausible that new formal and informal social assistance networks would be catalysed by the general surge in demand for such resources.

<i>Attributes of Disruptive Event</i>	Northridge (Los Angeles) and Osaka-Kobe Earthquakes	Paris Transit Strike	UK Fuel Blockade	Mexico City Day-of-Week Driving Ban	2004 Athens Olympics	Juneau, Alaska Energy Shortage²	Argentina Social-Economic Crisis	A Person's Acquired Disability	<i>RAC Car Use Reduction Scenario</i>
Duration	months	weeks	days	permanent	weeks	weeks	years	permanent	<i>years to permanent</i>
Advance knowledge of event	no	yes	no	yes	yes	no	no	no	<i>yes?</i>
Advance knowledge of disruption's duration	yes	no	no	no	yes	yes	yes	yes	<i>yes</i>
Effect on travel times and unreliability	↑	↑	↓	↓	↑	--	--	--	↓
Variable costs	↑	↑	↑	↓	↑	↑	--	--	↑
Cause	natural	anthropo-genic	anthropo-genic	anthropo-genic	anthropo-genic	natural	anthropo-genic	natural	<i>anthropo-genic</i>
Extent of Disruption	regional	regional	national	regional	regional	regional	national	individual / family	<i>national</i>
Year & development of country³	1994 (LA), 1995 (Osaka), developed	1995, developed	2000, developed	From 1989, emerging	2004, developed	2008, developed	1999 – '02, emerging	--	<i>2008+, developed</i>

Figure 6: Table of attributes of disruptive events

² An avalanche on 16 April 2008 damaged Juneau's electricity distribution system. Power usage dropped 30% within weeks as prices quintupled. The system was repaired by 1 June, but power usage has remained below the rate of previous years. Customers paid the higher rates for one monthly billing cycle, which has different start dates for each customer. (Juneau Empire 2008)

³ Categorisation of countries [developed, emerging, developing] based on Morgan Stanley Capital International's All Country World Index (2006)

11.3 Behavioural responses to non-marginal car use reduction

Turning to the body of literature on how people might respond to an involuntary cost of reduction scenario, it can be noted that previous research in the discipline has found that:

At the outset of the change, some households may simply accept and absorb the added costs or burden introduced by the [car use reduction] policy and continue their lives as usual...Depending on the household's ability to reschedule [its activities], economic and social hardship, or lack of independence may accrue in the medium term...Failing this, more significant changes in activity patterns, vehicle ownership, and lifestyle may be considered in the long-term...households may also choose to conduct more activities in the home via teleworking or teleshopping.

Even relatively straightforward stated response strategies often lead in reality to important primary and secondary effects on observed activities and travellers, realised through a sequence of rescheduling decisions over time and space and across household members. (Doherty et al. 2002)

Gärling et al. 2002 speculate on a similar set of likely impacts of reduced car use, as shown in their table (reproduced below) of potential coping strategies and second-order effects. While this listing of effects is plausible, there are two major complications. First, effects are likely to be specific to the chosen car restraint policy, whether quota-based, financial [dis]incentives, personalised travel planning, or otherwise. Further, the timescales of impacts are likely to depend on the degree of advance knowledge of the policy in general and its perceived permanence.

Figure 7: Possible negative effects of car use reduction

Possible Negative Effects of Car Use Reduction		
<i>Short-term effects</i>	<i>Intermediate effects</i>	<i>Long-term effects</i>
Compressing activities in time	Changing residence, workplace or work hours	Reduced subjective and objective well-being
Switching to slower travel modes	Teleworking	Worse family functioning
Increased trip chaining	Change of leisure activities	Psychological and physiological stress
Increased combination of activities and coordination of trips		

Source: Garling et al 2002: p.99

A salient point in the literature on adjustment and coping is that the analysis unit in some models is the *family*, whilst in others it is the *person*. It would appear that the distinction is context-dependent. Travel behaviour has well-developed traditions of analysis with both units in different types of analysis. Given the results of prior exploratory research into car

use disruption, when considering a cost of reduction scenario it seems prudent to start from the family as the appropriate level of analysis. As the economist Gary Becker noted:

“...economists in recent years recognise that a household truly is a ‘small factory’: it combines capital goods, raw materials, and labour to clean, feed, procreate, and otherwise produce useful commodities.”

(Becker 1965)

In the context of a cost of reduction scenario, given the complexity of family-member interactions in the travel-activity domain, working with the household as the unit of analysis appears the more logical choice (e.g. Gärling et al. 2000; Doherty et al. 2002).

In the case of (Doherty et al. 2002), emphasis was placed on eliciting coping mechanisms and strategies in as realistic a manner as possible from a small sample, rather than performing complex statistical analysis. The approach was taken to gather a week’s travel diary from respondent households in advance of the interview. They were then asked to rearrange their week’s spatio-temporal activity-travel schedule in response to either a step-increase in fuel price or the unforeseen loss of a household vehicle.

The experimental design of Doherty et al. (2002) is in contrast to the Gärling et al. (2000) and Loukopoulos (2004, 2006) stated response exercises, in which respondents were probed about coping strategies more generally, in response to less tangible cost of reduction scenarios but with more traditional survey instruments. These studies, however, gathered structured databases which permitted the use of statistical data analysis. Of particular interest are the findings of Gärling et al. (2000), in which respondents generally were unable to make changes to their real-world travel behaviour which they had identified as feasible whilst in the laboratory environment and agreed to implement.

A body of literature also exists on people’s behavioural responses to congestion, which has the advantage of being revealed-behaviour. For instance, Mokhtarian et al (1997) report (within the context of city workers in San Diego, California) three key findings:

1. ...individuals perceive the set of alternative coping strategies as consisting of strategies ordered on the basis of costs. Thus, individuals are likely to adopt low-cost strategies before they adopt higher-cost strategies.
2. ...individuals who face increasing congestion view the choice of alternative coping strategies in a manner which is, among other things, dependent upon their socio-economic and demographic characteristics.
3. ...policy measures designed to reduce travel may have a smaller impact than expected, as individuals try first to maintain current levels of travel while reducing the personal impacts of congestion.

The findings from Mokhtarian et al. are broadly consistent with the conceptual models of behavioural adjustment, and tend to support the use of the household as the unit of analysis.

11.4 Techniques for estimating the costs of lifestyle shocks

Quite recently, two separate research teams have independently investigated the same UK panel dataset with similar lines of inquiry regarding the well-being of people who suffer a disability (see Section 3.) One researcher concludes that “*Disability was associated with moderate to large drops in happiness...followed by little adaptation over time*” (Lucas, 2007). Meanwhile, the other research team found that the coping process recovers roughly 30% and 50% of the decrease in happiness associated with moderate and severe disability, respectively (Oswald and Powdthavee 2008). [Note that a recovery value of less than 100% implies partial losses in happiness relative to pre-disability.]

The structure of ongoing post-adaptation costs, as we might expect, appears to be a function of the type of life-disrupting event. Clark et al. (2008) presents empirical evidence that people are able to adapt more or less fully to certain life-disrupting events (divorce, widowhood, childbirth, and layoff) but not others (unemployment in particular.)

The techniques used in these research studies are known as *subjective well-being* or “*happiness*” economics. In essence, researchers ask survey respondents to indicate their subjective well-being, typically on a numbered scale.⁴ Statistical techniques are then employed to relate various aspects of participants’ lives with their stated level of life satisfaction. By comparing the well-being impact of a subjective event (a period of unemployment, for instance) with effects associated with income, one can estimate the costs that people ascribe to the subjective life event. Sample graphics of the findings from Clark et al. (2008) are in the appendix; they illustrate the use of such subjective well-being techniques. There is a consensus amongst researchers that well-being is an important criterion, though there are issues of measurement and interpretation, and it is generally proposed as one criterion amongst several in policy analysis (Loewenstein and Ubel 2008; Kahneman 2005; Adler and Dolan 2008).

Other research procedures from the social sciences are also relevant to estimating costs of adjustment. *Contingent valuation* involves the use of survey instruments on people’s willingness-to-pay or willingness-to-accept either the maintenance or a change to the status quo of a given situation. It is used to estimate prices for non-market goods; perhaps it is best-known for its use to place values on environmental resources (Venkatachalam 2004). In the transport field it has been used widely to, for instance, estimate the value of safety improvements (Schwab Christie and Soguel 1995). In essence the well-being economics techniques attempt to infer the value of non-market items, whilst contingent valuation methods directly ask respondents how much they value the items in question.

⁴ In response to a question such as: *How dissatisfied or satisfied are you with your life overall?* (7-point scale; British HH Panel Survey), *How satisfied are you with your life, all things considered* (10-point scale, German Socio-Economic Panel Survey), or *Taken all together, how would you say things are these days — would you say that you are very happy, pretty happy or not too happy?* (US General Social Survey)

12. Conclusions and recommendations

The literature review has served to identify a number of core guiding principles for future research into the nature of car dependency and how this might be addressed through public policy in the future. Firstly, there is a clear need to make the distinction in our discussions between people's generalised car use behaviours and travel trends, car reliant trips (those where no alternative form of transport is available), car dependent activities (those which cannot reasonably be undertaken without a car, such as shopping trips or complex trip chaining activities), car trips that are open to behaviour change but which are currently constrained by intervening factors such as cost, poor alternative transport availability or other barriers to behaviour change and almost addictive driving behaviours.

One of the problems in the literature has been that the term 'car dependence' has often been used interchangeably to describe this broad spectrum of quite different kinds of car use behaviours. For this reason, it is considered useful at this point to categorise and redefine the various terminologies. This is presented in the table below:

Figure 8: Categorisation of the term car dependence as identified in the literature

A car reliant trip	Where there is no other form of transport available and the journey distance is too long to walk or cycle
A car reliant activity or journey purpose	Where it would be difficult to make the journey another way because of carrying shopping or other heavy goods or undertaking a complex multi-destination trip
A car reliant location	Where it is virtually impossible to access a given location by any other mode of transport or where it is impossible to live in place without a car (e.g. a deeply rural village with no local facilities)
A car reliant lifestyle	Where it would be difficult to fulfil all the activities necessary to maintaining a current way of life without a car
A car reliant person	Someone who would not be able to get around without a car because of reduced mobility
A car convenient journey	Where the alternatives are perceived as less attractive or unreasonable because of the additional cost or longer journey time or escorting young children
A car dependent person	Someone who uses their car as a statement of status or for reasons of self-esteem or identity
A car addicted person	A car fanatic, who talks incessantly about cars and whose whole life revolves around the need to drive.
A car reliant society	High and increasing levels of car use are observed among the population as a whole and where people without cars are excluded from essential activities

The list in this table is not exhaustive and the categories are not mutually exclusive but it serves to illustrate that we need to be clear exactly which of these behaviours we are dealing with, since what motivates one of these may be entirely different to what motivates another.

The review has identified that in most instances the term *dependence* is used in the sense of 'reliance on' and **is not** necessarily intended to imply an *addictive* or *pathological* behaviour. The literature establishes that there are huge practical advantages to be gained from car-based travel in terms of the additional accessibility, time flexibilities and convenience it offers to individuals. In addition, some people may experience certain socio-psychological benefits, such as feelings of increased status and self-esteem, independence, socialisation and the broadening of aspirations and cognitive horizons.

Socio-psychological theories and models of car use behaviour establish that the key overriding motivation behind people's preferences for car-based travel is habit, but that this is also influenced by a personal intention to make this choice. These intentions will be affected by their past experiences of other modes and also their current perceptions of its availability, efficiency, convenience. They will usually offer a *heuristic* or 'rule of thumb' assessment of this when asked to reflect on the possibility of using these alternative options, however, often these assessments are borne out in case of fact, which helps to reaffirm people's behaviour choices and embed their existing behavioural patterns.

The literature also suggests that we must be highly aware of the different kinds of driver both in terms of their socio-demographic characteristics, social and psychological motivations, economic and physical circumstances and their roles and responsibilities. These factors will all have an influence on their travel choices. This finding suggests that to be effective, policy interventions that aim to change people's car use behaviours need to be more sensitive to the many different reasons why people prefer to travel by car and more responsive to these different underlying motivations. This would mean using multi-instruments (i.e. using fiscal incentives and disincentives, information and awareness-raising campaigns, technological fixed and infrastructure and service improvement in a seamless and integrated manner), be multi-levelled (i.e. targeted at individuals, businesses and institutions locally, nationally and internationally) and be context and audience specific.

Even if this approach is followed people are likely to be highly resistant to behaviour change where their car use is concerned. We know that many people are prepared to hold on to their existing car use behaviours even when this requires compromising other areas of household expenditure or requires putting up with adversarial driving conditions, such as congestion. They will even do this when there appear to be affordable and convenient alternatives available to them. It would be wrong to assume, however, that these choices are *irrational* in the eyes of the person undertaking them, although they may largely be a function of habit and 'locked-in' societal norms. In other words, we live in a car-dependent society where many of our daily economic and social activities would be impossible without the car and it is within the context of this 'whole system' that individual car use behaviours needs to be understood.

Despite the large and wide ranging academic literature describing case study initiatives to encourage the use of public transport and non-motorised modes in the UK and abroad, there is a general lack of rigorous evaluation of precisely what does and doesn't work in policy terms in reducing reliance on the car. More importantly in terms of our study, the economic

and social consequences of significantly reducing people's car use and the wider costs of such an adjustment is very poorly understood by both academics and policymakers. It is vital that research provides better insights into these issues before we enter blindly into policy scenarios that run the risk of unintentionally undermining the very basis of people's economic and social well-being.

There is a useful body of literature describing conceptual models of how people cope with involuntary modification to their lifestyles, which could provide some useful insights into the processes through which people would adjust to car use reduction. In addition, there is literature on estimating the costs of adjusting to other life shocks, such as unemployment, disability, and divorce. In recent years there have been academic inquiries into a number of circumstances (e.g. earthquake infrastructure damage) which provide some limited insight into how people might respond to car use reduction, however, none of the situations are similar enough to make robust and thorough inferences.

Some limited empirical evidence already exists on observed individuals' behavioural responses to petrol price increases, congestion charging and other enforced reductions in car use, but this is a highly under-researched area and only looks at short term costs of adjustment. We could find no evidence to suggest the wider impacts that significant car use reduction would have on the wider economy or society at large over the longer term. We believe it is vital that research provides better insights into these issues before we enter blindly into policy scenarios that run the risk of undermining the very basis of people's economic and social well-being.

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Appendix 1: Summary of empirical datasets collected following disruptive events

Disruptive Event	Description	Reference Literature
Northridge (Los Angeles) Earthquake	Multiple retrospective surveys	Boarnet (1998) Giulano and Golob (1998) Gordon et al. (1998)
Osaka-Kobe Earthquake	1) Pre/post panel survey (n~800) inquiring about frequency of visiting different sectors of the city 2) Pre/post panel 1-day trip diary (n~200) 3) Post-event survey of residents and firms 4) Post-event survey of residents (n~400) inquiring about trip frequency / modal usage 5) Post-event survey (n~2,000) inquiring about trip frequency / modal usage 6) Post-event survey (n~500) inquiring into about trip frequency / modal usage 7) Post-event survey of firms (n~900) inquiring about employee commute patterns	Results in various publications are summarised in Kitamura et al. (1998)
Paris Transit Strike	Retrospective telephone survey (n~4,000) inquiring about coping strategies	Coindet (1998)
UK Fuel Blockade	1) Focus groups (n=24) on topics of: attitudes towards the car, existing travel-activity patterns, viability of public transit, impacts of the blockade, adaptations, and sustainability of adaptations. 2) Telephone survey (n~1,000) inquiring about the degree to which respondents' lives were affected by, and their responses to, the inability to purchase fuel during the blockade	Polak et al. (2001) Noland et al. (2002)
Hammersmith Bridge Closure	Pre/post survey (n~1,000) of drivers using the bridge, inquiring about their usage of it and anticipated and actual coping strategies.	Cairns et al. 1998
Mexico City Day-of-Week Driving Ban	Quarterly gasoline consumption for Mexico City metro area (1987 – 1992)	Eskeland and Geyzioglu (1995)
	Household survey of demographics & car ownership, n~1,000, c.1990	
A Person's Acquired Disability	British Household Panel Survey, n~10,000, from 1991 to present	Oswald and Powdthavee (2008) Lucas (2007)
Military Family Relocations	Household survey of married U.S. Army families living in bases in Germany, n~1000. Questions about relocation strain, family life events, family system resources, social support, coherence and meaning, and adaptation.	Lavee et al. (1985)
Argentina Social / Economic Crisis	Survey (n~2800) of the coping strategies used by families in response to the crisis, as well as "changes in mental and emotional status."	Fiszbein et al. (2002)

Appendix 2: Sample graphic of *subjective well-being* analysis from Clark et al. (2008): p.F234.

The Y-axis is the effect on life satisfaction, as self-reported by survey respondents to the question: *How satisfied are you with your life, all things considered?* The scale ranges from 0 (completely dissatisfied) to 10 (completely satisfied.)

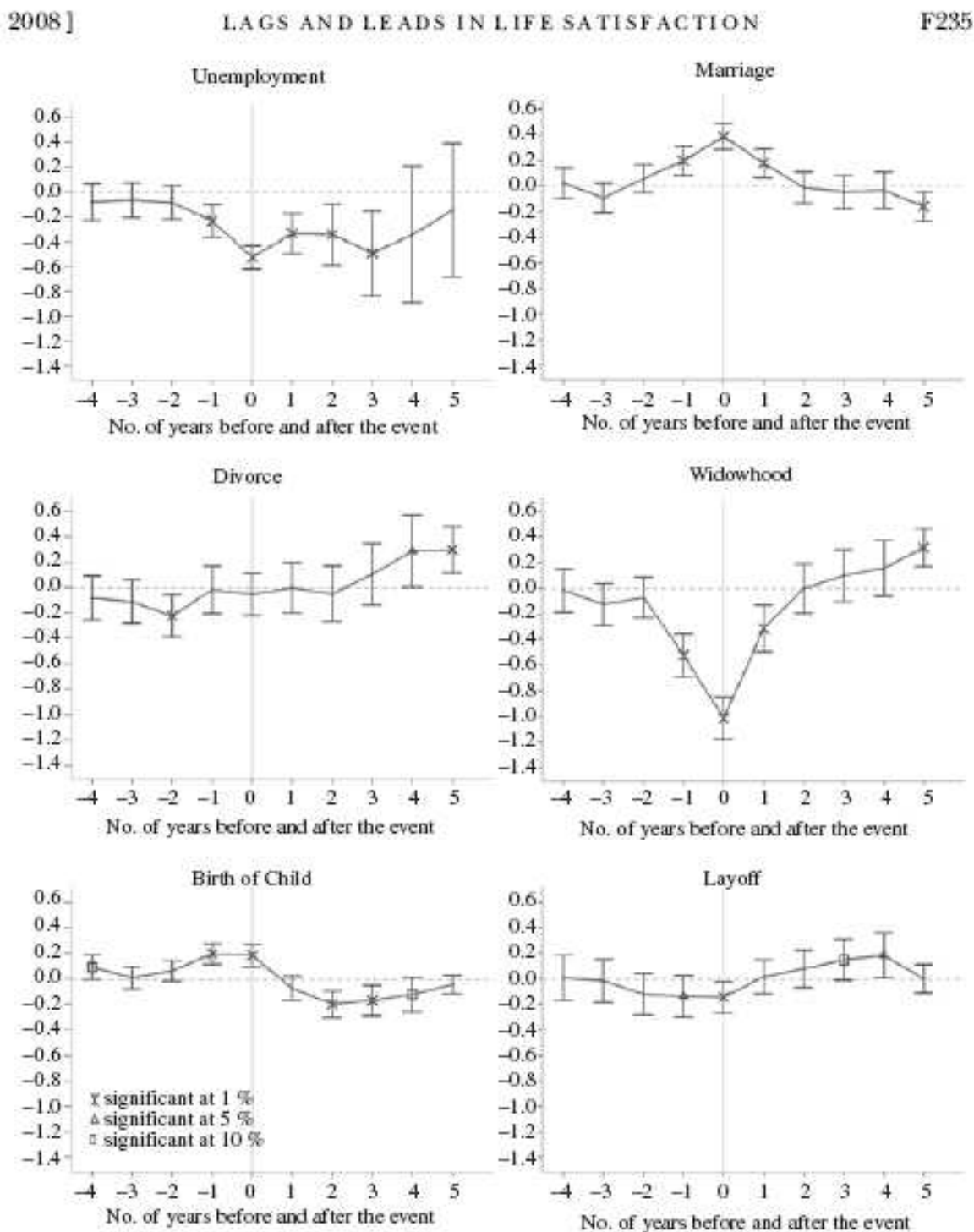


Fig. 2. *The Dynamic Effect of Life and Labour Market Events on Life Satisfaction (Females)*

