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The evolution of urban mobility: The interplay of academic and policy perspectives☆

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ABSTRACT

Urban mobility in Western countries has evolved substantially over the past fifty years, from an early interest in catering for growing car ownership and use through major road expansion, to the current emphasis on reducing car use and cutting back on road provision, encouraging sustainable travel and promoting liveable cities with a high quality of life. This can be observed in the changing patterns of car use in many European cities over time (i.e. a rapid increase followed by stabilisation and now decline). This evolution can be related to changes in the transport policy paradigm, which has been heavily influenced by the involvement of an increasing range of academic disciplines, many of which have contributed to modifying the supporting data collection, modelling and appraisal methodologies. The paper explores the varying interplay over time between academic/applied research and policy practice, and the methodological legacy left by earlier perspectives on urban mobility. It highlights a recent reinterpretation of mobility provided through taking a 'socio-technical perspective', and speculates on how policy thinking on urban mobility might further evolve over the next forty years.

1. Introduction

The evolution of urban mobility can be seen as the outcome of a complex and changing set of interactions. On the 'demand' side contributing factors include varying demographic patterns linked to economic growth and societal changes, resulting in new patterns of consumption; while on the supply side there have been major changes in transport infrastructure provision, often associated with advances in technology. Transport policy has also played a major role, not only by funding major transport investments, but also through the introduction of a broad range of physical, regulatory and pricing measures. Such measures have varied over time and have been introduced in response to a changing set of perceived concerns, policy objectives and priorities. (See Table 1.)

As part of this evolutionary process, it is argued that academic and applied research has had a major influence on the policy discourse, both through its contribution to the framing of the debate at a conceptual level, and through methodological advances in data collection methods, analysis and modelling techniques, and appraisal methods.

The paper addresses this thesis under five headings. First, in Section 2 it broadly reviews the evolution of urban transport policy perspectives and how they relate to changing conceptualisations of what urban mobility involves; and then provides some empirical evidence to demonstrate the travel consequences of this evolution in Section 3. Section 4 looks in more detail at the interplay between transport-related research and policy practices, and the resulting influences on policy formulation and on methodology. Section 5 broadens the perspective to look at wider technological and behavioural influences on travel behaviour, and Section 6 brings this information together to look to the future: how might urban mobility evolve in the coming decades? Finally, Section 7 draws out some implications and conclusions.

This is a wide-ranged paper intended to give a broad historical and prospective overview, and so it is not possible to investigate any individual issue in depth.

2. Evolving urban transport policy perspectives

Historically, there have been a number of transport revolutions in most countries, brought about by major advances in transport technologies [1]. The development of an inland canal system in many Western countries in the eighteenth century, coupled with advances in maritime shipping technology, greatly reduced costs of freight movement and stimulated the industrial revolution and the early stages of globalisation. Similarly, the development of railway networks starting in the nineteenth century further stimulated economic development, as well as further stimulating freight traffic, and enabled large numbers of

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people to move around their country relatively quickly and cheaply. In the twentieth century, it has been the advent of the motor vehicle and the building of fast, high capacity roads which has had the greatest influence on domestic travel, coupled with the development of the airline industry and its influence on international passenger and freight movements.

Urban scale and form have been greatly influenced since the late nineteenth century by the development of urban public transport systems, particularly rail-based [2]. But since the mid twentieth century it has been the explosive growth of motor vehicles in more advanced economies which has had the greatest influence on our towns and cities. It is this latter period – covering the last 40 to 50 years – which this paper focuses on.

During this latter period, in a number of larger cities such as London, New York, Paris, Tokyo and Vienna, we can observe an evolutionary development in transport policy, associated in particular with successive paradigm changes which have influenced problem identification and diagnosis and the kinds of solutions which are proposed.

Kuhn [3] introduced the concept of the 'paradigm shift', to explain major shifts in thinking. He postulated that scientific revolutions occur when scientists encounter sufficient anomalies, or questions that cannot be adequately answered within the current paradigm, which lead them to question accepted norms and to search for a new framework for discovery and analysis. This can lead to a major change in how the world is viewed, as in physics with the switch from a Newtonian to a Quantum Physics perspective. But, as in this example, where one paradigm did not entirely replace another, in the transport context it seems more appropriate to think of a paradigm enlargement rather than a paradigm replacement. This notion is alluded to in Heggie and Jones [4], who argued that there are different analytical and modelling 'domains' that are appropriate for tacking different kinds of issue.

Broadly speaking, we can characterise the evolution of urban transport policy over the past half century as a three stage process, summarised as follows [5].

2.1. Stage One: traffic growth policies — a vehicle-based perspective

Early stages of urban economic growth lead to a rapid increase in car ownership and use, and a resulting policy focus on meeting the 'inevitable' major growth in motor vehicle traffic, to avoid the city 'grinding to a halt'. This is often associated with the development or expansion of a domestic motor industry. The solution to this problem is seen very much in 'engineering' and scientific terms: as requiring investment in a major urban road building programme and measures to maximise vehicle capacity on existing urban streets, supported by large increases in parking provision, particularly at major trip destinations. In the process, public transport investment may be cut back, and road space taken away from street activities (e.g. market stalls), pedestrians and cyclists. Often too, extensive on-street tram systems are removed (e.g. as in London) to provide more capacity for motor vehicles.

This is often accompanied by land use policies designed to rationalise the use of urban space, through the introduction of zoning policies and non-traditional street patterns which favour car use over more sustainable transport modes. Many cities in this stage of development use North American cities as their role model. This vehicle-based paradigm is often widely supported by a range of groups in its early stages, not only by those in positions of power and wealth (who are the direct beneficiaries, as car owners), but also by the bulk of the population who aspire to car ownership and see road building as a positive sign of economic development, and may be directly employed in the motor industry and its associated industries.

This transport revolution requires a more strategic perspective than was necessary previously and usually involves major public sector investment; so it encourages the development of techniques which provide a more quantitative analysis of the relationships between transport and land use. This brings two new disciplinary views into the transport profession. First, mathematical skills to develop comprehensive vehicle trip origin–destination models, using gravity models, entropy maximising techniques and other tools from social physics; and, second, economists to develop formal appraisal methods that help to justify the large injection of public funds required to build major new urban road networks. The collective efforts of these various disciplines applied to large scale transportation studies led to the development of three-stage aggregate traffic forecasting models, combining vehicle trip generation, trip distribution and traffic assignment modules [6].

Quite soon, however, it becomes apparent that it is not possible to cater for unrestrained car use in larger urban areas with high to medium land development density — a car-centred city requires a lower density Los Angeles/Houston style city structure. In London, for example, even with proposals for an extensive urban motorway network, the three-stage traffic forecasting models were predicting demand levels several times greater than the proposed capacity [7]. And even that planned capacity could not be delivered: the construction of the first section of one of the proposed motorways in inner London led to such a public outcry that the conservative administration in the Greater London Council was voted out in 1973, and the incoming labour administration promised an end to major motorway construction in London, under the slogan 'homes before roads'.

In addition, the practical consequences of increasing levels of car use begin to become apparent, not only in terms of growing traffic congestion, but also through its effects on air pollution, traffic accidents and – more recently – concerns about rising CO_2 emissions. Such problems are currently being confronted in major Chinese cities such as Beijing and Shanghai, for example.

This leads to a policy impasse: how to cope with the pressures for traffic growth, if major road building is not an option? The major breakthrough comes by redefining the problem — the first paradigm change. Rather than catering for unlimited vehicle movement in urban areas, the primary objective switches to cater for growing person movement instead. This enables road traffic growth to be contained, while increasing overall levels of mobility.

2.2. Stage Two: Traffic containment policies — a person trip perspective

From a person trip perspective, the policy focus switches to one of moving people from their origin to destination, in the most efficient manner, so the mode by which this movement takes place becomes of secondary importance. Since public transport systems (buses, trams, trains, underground) use the limited available urban space much more efficiently than private cars, and can accommodate much higher numbers of people per unit area, the solution to the conundrum of how to cater for the rapid growth in vehicle demand in a physically constrained area is to switch much of this growth to other forms of transport. In practice, in the early stages of this policy transition, it has often been articulated in terms of accommodating as much car traffic as is manageable and then encouraging the rest to use other modes.

The switch in policy emphasis from providing additional road capacity to enhancing rail provision was given a strong boost by the publication of the 'Downs–Thompson paradox', based on empirical research in London and Paris [8]. This showed that average radial door-to-door speeds by car and rail are roughly the same, indicating paradoxically that the best way to increase average urban road network speeds is to raise average door-to-door speeds by rail – or by other sustainable transport modes. In much of western Europe and in Japan – and more recently in cities such as Beijing and Shanghai – there has been renewed interest and investment in rail-based public transport systems, while in South America the focus has been on building (cheaper) Bus Rapid Transit (BRT) systems, due to funding constraints. This shift in perspective has usually been coupled with increasing restrictions on car use, particularly parking controls in urban centres and access restrictions to counter high levels of air pollution, but without any major cutback