ACHIEVING A BALANCE BETWEEN CAR ACCESSIBILITY AND GOOD URBAN ENVIRONMENT

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1. BACKGROUND AND METHODOLOGICAL CONSIDERATIONS

This paper has been produced as part of the research project "Optimal balance between access by private car and the environment in town and cities". (See Gustavsson et.al. 1995, Gustavsson, 2000, Grudemo and Svensson, 2000, and Svensson, 2000. All reports in Swedish, but with English written summaries). The background to the project is the increasing use of cars in towns and cities, which has been a major problem for town planners and politicians during the whole post-war period. The increasing use of private cars threatens the safety of other road users, for example pedestrians and cyclists. It is also related to a reduction in the number of people using public transport systems which, as a consequence, forces the operators to raise fares, run fewer routes, reduce frequencies and so on. There is no doubt that the increasing volume of motorised traffic has negative impacts on the environment in towns and cities. Important, but analytically difficult, values such as "beauty, comfort, and safety" are under constant pressure from the space-consuming private car in urban settings. The underlying objective for the entire research project is to investigate if the documented development in this area is in line with the public interest, or if there is an imbalance between the actual outcome and the inhabitants' preferences.

The central issue concerns the balance between the benefits to an individual of car-access and the public benefit of a good urban environment. There is no functioning market where this balance can be effectively settled because "urban environment" is an example of a public good that can not be purchased in desired quantities on a traditional market. Problems of non-rivalry in consumption and free riders hamper the functioning of the market as an efficient mechanism for allocating scarce resources. The isolated behaviour of an individual, or a household, has a negligible impact on the total outcome, which in turn influences the behaviour in certain directions.

An individual, or a household, may find it very attractive to use the car frequently, due to its advantages in terms of carrying capacity and travelling speed, over walking, cycling or public transport. The private car facilitates transportation over large distances, directly monitored by the individuals own decisions concerning departure times, routes, frequencies and so on. The car facilitates, for instance, the transportation of heavy carrier bags between stores and homes.

However, the efficiency of an individual's use of the car is dependent on other car-users decisions. The ideal situation, from the point of view of a particular household, can only be reached if everyone else chooses not to use the private car as a means of transportation. The possibility to use the car in an efficient manner, on an individual level, is threatened by increases in the total usage of cars in urban areas. Congested streets, noise and emissions also reduce the general attractiveness of inner cities and residential areas, with negative consequences for commercial activities such as stores, restaurants, bars, cafés, and for "beauty, comfort, and safety" etc. There is no mechanism a single individual can use to alter the situation in a more favourable direction, due to the absence of functioning markets. The revealed preferences, manifested in the actual car usage, can, at least in principle, result in a situation that is demanded only by a minority of the individuals. This discussion can perhaps be seen as an application of the well-known theorem "the tragedy of the commons", as far as urban traffic and local environmental consequences are concerned.

In order to prevent major costs occurring due to the possibly presence of market failures, town planning and other policy measures have to work as a proxy for an ideal consumer acting on a well-functioning market. Town planning should, at least ideally, function as an institutional regulation capable of mitigating the problems associated with market failures. Therefore, it is necessary in order to foster right decisions, that the planning measures and policies are based on relevant research and knowledge The rationale for this study is to contribute new knowledge to this problematic, but nevertheless, important and interesting research field.

This can be achieved in several ways. One alternative can be labelled "social engineering" and involves identification, quantification and evaluation of different environmental factors in an expanded cost-benefit framework, where different methods can be used in the analysis, especially when evaluating. There are, however, major obstacles to be overcome when applying a traditional cost-benefit framework to these research questions. "An attractive inner city" is a very complex commodity with several attributes and qualities, difficult to decompose and value separately, which is necessary when performing cost-benefit calculations. Without rejecting the possibility of using traditional cost-benefit methods entirely, one must accept the severe problems associated with the approach in this particular case.

There is also the political alternative of asking people directly through a referendum, which in a sense would make the research discussed in this paper somewhat superfluous. The actual approach chosen in this project is a survey by means of questionnaires, the purpose of which is to determine the preference structure of individuals regarding different urban designs, with respect to the balance between individual car-access and the public benefits of a decrease in motor traffic.

By allowing individuals to choose between different scenarios "packages" of environmental effects and transport benefits are in focus, thereby, at least in the ideal case, bypassing the decomposition problem following the traditional cost-benefit approach. If this approach is successful it can be used as an alternative to costly referendums and the results can be interpreted in economic terms and give the same information as a traditional cost-benefit calculation. All approaches, following traditional economic theory, must in an analytical sense be founded on the same balance between costs and benefits that would have been reflected in the equilibrium conditions and solutions on an ideally functioning market.

The approach applied in the study is best suited for situations where the same individual confronts both costs and benefits as a result of different level of car access. The actual choice between different scenarios should in this case be the outcome of individuals balancing costs against benefits. This should be the factual situation for households living in residential areas in suburbs, and when the motor traffic in the inner city is in focus. Households living in the inner city can achieve individual gains from an extensive car access but encounter costs caused by the increase in the total motor traffic volume, in the same manner as the suburban inhabitants in their residential areas. Moreover, the quality of the inner city environment concerns everyone in the actual city, including those who travel to the central business district for shopping, recreation and, of course, work purposes.

The approach adopted here is, however, not suited for analysing the problem of private car traffic in the residential areas located around the inner city. Motor traffic in this part of the city is to a large extent characterised by through traffic to and from the inner city. Therefore, it would be wrong to assume that winners and losers are the same individuals. Contingent Valuation Methods (CVM) and other approaches can be used in order to deal with the problem of evaluation in an analytical economic framework. The essential research problem to tackle is the optimal balance between ordinary traffic benefits "on the road" and environmental costs suffered by the households in the nearby surroundings. Studies using CVM have been carried out as part of the project, but the results will not be discussed in this paper. (See Grudemo, 2000).
The challenge confronting the research methodology is to construct and describe different scenarios correctly and in such way that the individuals answering the questionnaire can absorb and understand all the information given. This is extremely important when focusing on the differences between the various alternatives and the associated trade-off between individual car-access and the public benefits of a decrease in motor traffic.

2. PURPOSE AND DATA ACQUISITION

The purpose of this study is to investigate and analyse the balance between the benefits to an individual offered by unlimited car-access and the related consequences of overall traffic volumes, that individuals would choose if the connections between these variables were made clear.

This research question is tackled by letting individuals choose among different scenarios concerning the design of inner cities and residential areas in suburbs, by means of a questionnaire. These scenarios are presented by using different, but complementary, techniques. Each scenario has a heading. The questionnaire about inner cities describes three different scenarios and the questionnaire about residential areas in suburbs describes four scenarios. Drawings and short paragraphs of one or two sentences illustrate the scenarios. The paragraphs are clustered in different groups. One group of paragraphs describes the main feature of the particular scenario and five groups with the subheadings car, car parking, bus, cycling and walking, respectively. The descriptions of the scenarios do not specify the possible investment costs associated with the transformation of streets, pavements, bicycling lanes etc., in order to achieve the actual traffic situation in each alternative. Many of the differences, however, can be realised by means of regulations with almost no investment costs at all, thereby justifying the attention on the particular economic costs and benefits following different levels of car usage, as discussed above.

By allowing the individuals express their attitudes towards different parts of the scenarios and answer questions concerning their socio-economic background and travelling behaviour, the analysis is further advanced

3. THE SHAPING OF INNER CITIES

The questionnaire concerned with inner cities describes three different scenarios, or alternatives, with the following headings:

A. Increase in motor traffic and street space for cars
B. Lesser space for cars and road pricing
C. Lower speed limits on smaller streets

The first alternative entails an accommodation of the design of inner cities to a greater use of private cars. Street capacity and parking facilities are expanded to cater for more cars. The amount of pedestrian streets remains at the present level but public transport experiences a falling number of passengers, which will decrease the quality of the supplied services. Bicyclists will find it more difficult to travel safely in increasingly car-adapted surroundings.
The second alternative's major ingredient is a pricing system that imposes a charge on car usage in the inner city. The revenues are used to subsidise bus transport with lower fares as a result. Travelling by car decreases and travelling by public transport increases as a consequence of the system. Some streets and roads are converted to pedestrian streets and bicycle lanes.
The third alternative is a so-called "traffic calming" scenario. ("Traffic calming" will be used throughout the paper as a somewhat imprecise collective term for measures that calm down the motor traffic, including regulations, design of road and streets with narrowing and barriers, broader pavements and cycling lanes etc.) Private car traffic is limited by means of lower speed limits, more pedestrian pavements and bicycle lanes, and special lanes for public transport only. By calming the motor traffic other means of transportation increase their competitive capabilities and gain a larger share of the travellers, at the expense of the private car.

The following table shows in percentages the alternatives chosen by the interviewees in the survey:

Table 1 The choice between different scenarios in inner cities

Alternative	A	B	C	Blank
Result	16	20	49	14

Almost 70 percent of the individuals in the survey are in favour of more restrictions on private car usage, which will have positive consequences for walking, cycling, and travelling by public transport in the inner city. Around one fifth of those surveyed prefer the road pricing alternative, but nearly 50 percent of the individuals prefer reaching the targeted balance by imposing speed limits and other regulations, and by redesigning streets in the described way. Traffic calming should therefore be an easier alternative for local policy makers to choose than a strategy involving reducing private car usage by road pricing. The acceptance problem connected with pricing road and street capacity is well documented in the literature. Further research is of course necessary before any definite policy recommendations can be made.

Alternative C is the most popular choice among almost all categories of individuals in the research material. It is interesting to note that even among frequent car users, alternative C clearly stands out as the most popular scenario. This is not surprising considering the percentage in table 1 and the fact that a majority of households in developed western economies own one or more private cars.

There is, however, one group of individuals that prefer a continued accommodation of the inner city to a greater usage of cars, by increasing street capacity, parking facilities, regulation in favour of private cars etc. Car access is of course a very important characteristic of inner city quality for these individuals. The results suggest that around 15 percent of the population in Swedish cities embrace this preference regarding the design of inner cities. It can also be shown that a vast majority of these individuals do not live in the inner city.

Despite the fact that the alternative C is consistently the most favoured alternative, different explanatory factors can be used in order to focus one some crucial differences concerning the choice between the design alternatives. Factors such as sex, car ownership and/or car access, car usage, type and location of housing and travelling behaviour in general seem to influence the choice.

The following table displays, as an example, how the preferences expressed by men and women differ.

Table 2 Choice of scenarios, differences between women and men, percentage shares

Alternative	Women	Men
A	6	27
B	22	17
C	59	40
Blank	13	15
Sum	100	100

The largest relative difference concerns alternative A, popular among men, and alternative C, popular among women. Although there are differences between men and women, alternative C is clearly the most favourable scenario for both sexes. Similar patterns can be found when analysing the impact of other types of explanatory variables.

4. SUBURBAN RESIDENTIAL AREAS

The questionnaire used in this part of the research project describes four different designs, or alternatives, of a residential area in a suburban setting. It is important to note that such residential areas generally do not have severe problems with through traffic. The traffic resulting from private car usage is almost entirely constituted by travel in the particular area by residents and visitors. The area in the four alternatives is identical with respect to number of inhabitants, size, composition of different types of housing, rents, house prices etc. The only characteristic that varies between the four alternatives is the conditions for usage of cars and parking, which have consequences for public transport, pedestrians, cyclists and children's play on streets and other common areas.
The four alternatives are assigned the following headings:

1. More street space for cars
2. Lower speed-limits
3. All parking on the outskirts
4. Free of cars

In the first alternative car-access is unlimited and the area is designed to improve accessibility for cars. The fourth alternative is primarily designed for individuals and households without private cars, or households that use private cars very seldom in their everyday life. Ambulances, removal vans and other heavy vehicles can, however, employ the pedestrian and cycle lanes in the area. In the second alternative unlimited car-access is retained, but with the help of speed-limits, street design and other measures, the street space intended for relatively safe use by pedestrians, cyclists, children at play etc., is increased at the expense of car traffic, i.e. traffic calming. In the third alternative, car traffic is limited further. All car parking is located on the outskirts of the area and the pedestrian and cycle lanes can only be employed by cars when certain well-identified purposes exist. The services supplied by public transport are varied with respect to frequencies of bus departures during rush hours: departures with 20 minutes, 15 minutes, 10 minutes, and 5 minutes intervals for the alternatives one to four.

The following table shows in percentages, which of these four alternatives were chosen by the interviewees in the survey:

Table 3 The choice between different scenarios in residential areas in suburbs, percentage shares

Alternative	1	2	3	4	Blank
Result %	11	44	24	10	11

The largest share of the individuals prefers alternative 2, “Lower speed-limits”. This alternative is to some extent equivalent to the inner city alternative C “Lower speed-limits on smaller streets”. As was the case for inner cities, the most popular alternative is generally the same for different categories of individuals. There is a clear tendency towards a preference for living in detached housing with gardens and easy access and parking for private cars. Alternative 2 stresses, however, the importance that car access does not jeopardise the safety and comfort of cyclists and pedestrians. In this scenario, space sharing is the guideline for the usage of the common street and road capacity in the residential area.

As for the inner cities, one category of individuals can be found that prefers a much greater access by private car. This category represents around 10 percent of the individuals in the study. These individuals, typically, use no other means of transportation than the private car, live in detached housing and insist on having the possibility to drive to their residence and park closely, preferably in the own garage. However, which is important to note, car-owners or individuals that can use other household-members` cars, constitute the majority in each of the four chosen alternatives, from 85 percent of the individuals preferring “More street space to cars” to 60 percent of the individuals in favour of “Free of cars”.

Car-users are, therefore, not a homogenous interest group as regards preferences and opinions about how to monitor private car traffic in residential areas. Many individuals use, of course, several different means of transportation, including walking, cycling, driving and travelling by public transport, and prefer the compromises outlined in alternative 2 “Lower speed limits”.

Among individuals that prefer living in apartments in multi-storey housing, alternative 3 “All parking on the outskirts” is a scenario that is equally popular to “Lower speed limits”. Many individuals stress the importance of having the possibility to use cars in the area when specific needs exists, such as unloading heavy carrier bags with groceries and other heavy articles. The answers imply that if this type of car usage where not allowed, the share in favour of the scenario “All parking on the outskirts” would have been substantially lower. This result suggests that these inhabitants accept rather ambitious general reductions of motor traffic in residential areas, as long as regulatory exceptions exist for some well-defined purposes.

Around 10 percent of the interviewees chose the almost completely car-free residential area. As mentioned above, ca 60 percent of these individuals use private cars to some extent. This fact explains why so many of the interviewees stress the importance of having the possibility to employ the pedestrian and cycle lanes in the area for ambulances, removal vans and other

heavy vehicles. It also explains why a fifth of the individuals in favour of the scenario dislike the long-term goal to make the area totally free of private cars with no parking possibilities at all, but with car rentals at walking distance. Individuals who prefer residential areas with a total prohibition against cars and car parking make up to a rather small fraction of all the interviewees in the study.

5. GENERAL CONCLUSIONS

The results of the study clearly show that, within the boundaries of the applied methodology, a majority of the individuals prefer scenarios where all kinds of road-users relatively safely coexist on streets and roads in towns and cities, and where this condition has been reached by traffic calming measures. Compared to the present situation in many Swedish towns and cities, this means a rather large reduction in car-traffic and parking in, especially, inner cities with corresponding improvements in safety and assigned capacity for pedestrians and cyclists. In general there is a strong tendency towards a preference for a mixed traffic situation, distinguished by the absence of a dominating means of transportation. Even if access by car is preferred in residential areas, the majority stresses the importance of guaranteeing the safety and comfort of pedestrians, bicyclists and children playing in the streets. The results indicate that traffic-calming measures have a great potential to limit car traffic in urban areas while road pricing and prohibitions will meet with greater resistance among public opinion, with consequences for the feasibility for the authorities to initiate different policies at local level.

6. QUESTIONS FOR FUTURE RESEARCH

The research, especially the results, presented in this paper must be seen as preliminary. The need for further investigations and research about the balance between the benefit to an individual offered by unlimited car-access and the related consequences of the overall traffic by private car is obvious. More knowledge is needed about which combinations individuals would choose if the connections between these variables were made clear. The applied methodology has to be developed further by, for instance, more and better-described scenarios. The most popular alternatives above, i.e. “Lower speed limits on smaller streets” for inner cities, and “Lower speed limits” for residential areas in suburbs, can be more specifically defined. There is still some ambiguity about the preferences for space sharing versus separation of different transport modes. Furthermore the investment costs associated with different designs of streets, pavements, cycling lanes etc., has to be specified in the questionnaires. There is also some “black-boxing” in the most popular alternatives concerning the costs and difficulties that could arise during the adjustment period until car usage has settled at a lower level. Moreover, the analysis of the choices made by individuals needs to be

more stringent and the usage of different statistical methods and models, perhaps in a discrete choice framework, has to be considered.

One improvement would be to make future research more concrete, perhaps by letting the scenarios correspond to factual streets, residential areas etc., in real towns and cities. There is, however, always the problem of cultivating the different characteristics in "real world" applications. The possibility of using photomontage and other more elaborate methods of illustrations can perhaps mitigate these problems. The experiences from developing Contingent Valuation Methods indicates the importance of describing the investigated object in a correct manner regarding local qualifications, especially in order to succeed when collecting data by means of questionnaires in surveys.

One conclusion from the research so far that has to be investigated in future research is the relative unpopularity of road pricing compared to traffic calming measures, which in practice will have identical impacts on car usage in towns and cities overall. Road pricing is currently seen as the main solution to the congestion dilemma that plagues car crowded cities. The theory of optimal pricing of street capacity is well developed and founded on conventional, but controversial when it comes to practical applications, economic price theory. By pricing relevant externalities, such as congestion imposed on fellow road users, an effective allocation of scarce resources, e.g. street capacity, is facilitated. If these measures can be used in practice without unreasonable high costs for charging and monitoring, there seems to be much to gain by pricing road capacity in towns and cities.

Traffic calming, on the other hand, can be seen as a bundle of administrative, or even bureaucratic, policies associated with high investment costs necessary to alter the design of streets and roads. Furthermore, it seems impossible to achieve the same degree of precision and economic efficiency with traffic calming as compared with road pricing. Following this line of argument traffic calming can be labelled as a measure belonging to a command economy ideology, with its well-known inefficiencies, and road pricing its corollary: a decentralised market solution to the dilemma of congestion etc.

However, this line of argumentation may be over simplified (Jansson, 1996). There are still many problems to solve before road-pricing systems can be widely used at a reasonable cost. Translating theoretically based recommendations and principles to applicable and practically working road pricing systems is still problematic and expensive. The investment costs required before any pricing system can be implemented, is still considerable and some technological problems have yet to be solved. But the acceptance and legitimisation problems seem to be the real stumbling blocks. Charges and tolls collected on entrance to roads, tunnels etc. are in most cases used to finance part of the investments and/or maintenance costs. Road pricing schemes with full recovery of congestion costs would result in huge revenues, at least in larger cities during rush hours, where the connection between payments and received service is not the standard case. It can be assumed that the pedagogical problem of explaining to people why this is for the public good would be somewhat difficult for politicians and the authorities. One obstacle to road pricing is that people are accustomed to driving on streets and roads free of charge and would resist any change to this tradition. These circumstances contribute to the difficulties associated with the political feasibility of introducing road

pricing schemes, even if it can be strongly argued that road pricing is necessary in order to ration and monitor the degree of road capacity utilisation in larger cities.

With traffic calming, on the other hand, it is possible to combine reductions in traffic by private cars with considerable improvements for other users of the streets, such as pedestrians and bicyclists, with identical measures. Compared with road pricing, the combined effect of traffic calming has greater potential of producing a larger number of positive consequences for the urban environment. Furthermore, the potential to create improvements in "beauty, safety and comfort" with traffic calming measures is considerable, which is enhanced by the fact that traffic calming can avoid the acceptance problem more successfully than road pricing, as is indicated from the results in the study. It should be remembered that speed limits, pedestrian streets, bicycle lanes, driving lanes for public transport only etc., are common features in many towns and cities.

The tendency to view road pricing and traffic calming measures as diametrically opposed ideas can be questioned, following traditional reasoning in transport economics. Both road pricing and traffic calming measure entail a rise in the generalised cost imposed on the traffic by cars; road pricing by monetary payments and traffic calming by increases in travelling time, i.e. costs elements that can be treated identically in an analytical framework.

To sum up the discussion so far it is clear that further research is needed with the purpose of investigating and analysing the relevant preference structure concerning the balance between the benefits to an individual offered by unlimited car-access and the related consequences of the overall traffic by private cars. It can also be stated that both theoretical and applied research have to be carried out in order to integrate road pricing schemes and traffic calming measures, which hopefully can contribute to more alternatives for local town planning and policy and, accordingly, a better urban environment.

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Gustavsson (2000) discusses the state-of-the-art in the relevant research field, with examples of practical applications and policies, with a more complete reference list.