RESEARCH ON URBAN TRANSPORT SUBSIDIES IN NEW ZEALAND

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ABSTRACT: *The Urban Transport Council (UTC) is currently undertaking major research on the provision of subsidies for urban public transport in New Zealand. The broad objectives of the research are to determine if there are valid economic or social reasons for providing public transport subsidies, and if there are, to determine the level of subsidies that could be provided on the basis of these reasons. The project is being conducted in two stages. The first stage was completed in July 1987 and involved a review of literature and analysis of arguments put forward for public transport subsidies to determine their validity and applicability to New Zealand. It found that there is a basis for providing public transport subsidies, primarily on economic efficiency and equity grounds. Stage Two is designed to establish the level of subsidies that could be provided on the basis of the first stage findings and to investigate the best means of subsidy delivery. Work on this stage will be completed in June 1988. Major subsidy policy changes will probably be implemented as a result of the research. These changes are likely to result in a different level and pattern of distribution of public transport subsidies than currently exists in New Zealand*

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INTRODUCTION

The Urban Transport Council (UTC) is currently undertaking major research to determine the optimal level of subsidies that could be provided for urban transport purposes in New Zealand(1). This research project is being conducted in two stages. Stage One, an evaluation of the arguments for and against public transport subsidies, was completed in July 1987; Stage Two, which is designed to determine the actual level of subsidies, will be completed in June 1988. The research results are likely to lead to a major re-evaluation of the UTC's subsidy policies and to the introduction of new forms of public transport subsidy assistance. This paper describes the background to the project and the results of the first stage, reports on the progress of Stage Two, and discusses the policy implications of the research findings.

BACKGROUND

The UTC's budget has halved in real terms since it was established in 1981. In its first full year of operation in 1982/83 it had a budget of $68.7 million. To have maintained this level of input in 1987 would have required a budget of approximately $121 million (March 1987 dollars). The UTC's actual budget allocation for the 1987/88 financial year was $66.5 million (and for 1988/89 it will be $58.5 million). Although this reduction has resulted in part from efficiency savings (particularly in rail), it does represent a real decline in the level of central government support for urban public transport. This reduction in funding has in recent years prevented the UTC from fulfilling its principal subsidy policy of matching the financial assistance provided to operators by local authorities. In this situation of declining Government funding and an inability to fulfill its subsidy policy, the UTC decided in 1986 to undertake a major policy review.

(1) This research has concentrated mainly on public passenger transport, although noting the wider definition of urban transport services in the Urban Transport Act.

Another important background factor that contributed to the decision to undertake this review was the economic policy of the Labour Government elected in 1984. Its policies have included removing subsidies and opening the economy to greater competition in association with reviewing the function and activities of the public sector. These policies raised fundamental questions for the UTC about its purpose and the financial assistance it provided. It therefore appeared timely to undertake a major review to consider these questions.

The principal objective of the review was to develop a sound rationale for the UTC's expenditure and to establish appropriate goals, objectives, and policies for the UTC. In the early stages of the review it quickly became apparent that the central question that needed investigation was "Why provide subsidies for urban transport purposes?" Although previous research in New Zealand had explored this question to some extent (NZIER, 1984; Urban Rail Review Committee, 1985), no in-depth investigation of the issue had been carried out. The UTC therefore decided to undertake major research to determine if there was a basis for providing urban transport subsidies and to establish an optimal level for such subsidies in New Zealand.

THE PROPOSED RESEARCH

It was proposed that the research be conducted in two stages. The first stage was to involve a comprehensive review of the literature on the subsidisation of urban transport services and an analysis of the arguments for and against subsidisation, an assessment of the applicability of the arguments to New Zealand, and the identification of what further research was necessary to establish an optimal level of public transport subsidies. In the second stage it was envisaged that specific studies would be undertaken to determine the optimal subsidy level; but these studies would be dependent on the findings of the first stage, (which may have shown that there was in fact no justification for public transport subsidies). The research design for the second stage was therefore not carried out until after the completion of Stage One.

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The terms of reference for Stage One were drawn up and approved by the UTC in October 1986. They specified the general objectives for the project as a whole and specific objectives for the first stage. The general objectives for the whole project were:

> "... to analyse the reasons for the subsidisation of urban transport services and to determine an optimal level for urban transport subsidies in New Zealand, in order to:
>
> (a) Enable the UTC to advise the Government of the appropriate level of financial assistance that it considers should be provided for urban transport purposes, and of the reasons for that assistance.
>
> (b) Assist the UTC to develop funding and other policies to promote the establishment and maintenance of appropriate urban transport systems in New Zealand.
>
> (c) Assist local and regional authorities in developing a full understanding of the urban transport policies and funding practices applied by the UTC."

Specific objectives for the first stage were to:

> "(a) Identify the various schools of thought and the variety of arguments in respect of the reasons for the subsidisation of urban transport services;
>
> (b) Evaluate the validity of the arguments in terms of economic, social and other considerations, and make a general assessment of their applicability to the subsidisation of urban transport services in New Zealand;
>
> (c) Identify what further research is necessary to determine an optimal level for such subsidies, the proportions that should be contributed by central and local government, and the appropriate means of subsidy delivery."

An invitation to consultants to submit proposals for the project was issued by the UTC in late 1986. After evaluation of the proposals received, the Australian consultancy Travers Morgan Pty Ltd was commissioned to undertake the project. Work on the first stage commenced in February 1987 and was completed in July that year. The final report was published in two volumes in September 1987, (Travers Morgan, 1987).

FIRST STAGE RESULTS

The results of Stage One fall into five main areas:

(i) analysis of the arguments for and against subsidy in terms of their theoretical basis and the evidence presented in the literature to support their existence in practice;

(ii) evaluation of the arguments for public transport subsidies in terms of the objectives of providing subsidies;

(iii) central or local government responsibility for subsidies;

(iv) applicability of the various arguments for subsidies to New Zealand;

(v) future research requirements.

Each of these areas is discussed below.

Analysis of Arguments

Travers Morgan's analysis of the arguments for and against public transport subsidies is summarised in Table One. The arguments were analysed in terms of their theoretical soundness and the practical evidence to support them. Several arguments for subsidies were dismissed at the early stages of analysis and are not included in the table. These arguments were that public transport is an infant industry, the common-law rationale, and the misperception of costs by private motorists. Of the arguments subject to further analysis, only two of those for subsidy fully met the criterion of theoretical soundness (producer economies of scale and road

TABLE 1 : ANALYSIS OF ARGUMENTS

Argument	Evaluation Criteria: Theoretical Soundness	Evaluation Criteria: Supporting Evidence
FOR SUBSIDY		
Economic		
Producer Economies of Scale	***	*
User Economies of Scale	**	*
Road Congestion	***	**
Land Use	**	*
Environmental		
Traffic Safety	**	*
Noise Pollution	**	*
Air Pollution	**	*
Energy Conservation	**	*
Social		
Income Redistribution	**	**
Improved Mobility	**	*
Other		
Option Value	*	*
Merit Good	*	*
AGAINST SUBSIDY		
Economic		
Technical Efficiency	***	***
Cross-Subsidy	**	*

Key: *** Meets criterion best
* Does not meet criterion well

Source: (Travers Morgan, 1987, p.28)

congestion). The option value and merit good arguments did not meet this criterion well, while the remaining arguments were of moderate theoretical soundness. None of the arguments for subsidy had strong supporting evidence.

Of the arguments against subsidy, technical efficiency met well the criteria of theoretical soundness and supporting evidence, while the cross-subsidy argument was considered to be reasonably theoretically sound. The conclusions on each of the arguments were:

(a) **Arguments for subsidies**

(i) Infant Industry

The argument that public transport is an infant industry that requires subsidy to enable it to be placed on a sound financial footing has no validity as the public transport industry has existed for many years, and until recently, without subsidy.

(ii) Common Law Rationale

The so-called common law rationale argues that subsidies are justified as they ensure continuity of service to meet transport needs on which employment, business and locational decisions have been previously made. The argument has, in practice, no basis in law. It is an argument for the status quo. Many government services and programmes change over time and cause adverse distributional effects. These adverse effects are not an argument in themselves for not making change, if the total benefits exceed the costs.

(iii) Misperception of Costs

This argument states that private motorists cause distortions in the relative demand for private and public transport as they incorrectly perceive the costs of private travel. This argument is implicitly allowed for in other arguments. The basis of the road congestion argument is that motorists do not experience the full costs of their

travel, and the externality arguments (land use, environmental) are also based on such incomplete costs.

(iv) Producer Economies of Scale

This argument claims that economies of scale in the production of public transport justify the payment of subsidies. The theoretical basis for the argument is strong, although practical evidence does not support the existence of economies of scale in bus services, and no evidence could be found for urban rail services. Economies of scale do however exist in railways in general and could be expected in urban railways.

(v) User Economies

The argument that there are economies of scale to users resulting from the frequency benefits associated with scheduled public transport services has a reasonable theoretical basis. The literature review did not reveal any attempts at direct measurement of these benefits.

(vi) Road Congestion

This argument states, that as roads are underpriced, competing public transport should also be underpriced to maintain the marginal conditions. The argument has a strong basis in economic theory, but direct measurement of the required levels of subsidy is not common in the literature.

(vii) Land Use Effects

This argument claims that as public transport services improve accessibility and thereby land use patterns, subsidies

can be used to achieve desirable land use patterns. The theoretical basis for the argument is moderate but the supporting evidence is weak.

(viii) Environmental Effects

This argument claims that improved or cheaper public transport results in lower total environmental costs due to the diversion of some people from car to public transport travel. The environmental effects considered in the study are traffic safety, air quality, noise levels, and fuel usage. The theoretical basis for the argument is moderate however little evidence to support it was found in the literature.

(ix) Income Redistribution

This argument claims that public transport subsidies redistribute income to the less well off. The theoretical basis for the argument is moderate, as is the supporting evidence. General subsidies appear to rely almost entirely on the redistributive effects of taxes used to finance subsidies to achieve income distribution effects, while subsidies targetted to those on low incomes can redistribute income no matter what the financing source.

(x) Mobility for the Transport Disadvantaged

In this argument it is claimed that public transport subsidies enable the provision of services which assist transport disadvantaged groups. Without such subsidies the mobility of these groups would be restricted as they do not generally have access to private vehicles. The argument has its basis in equity and is moderately sound. However there is little supporting evidence for

the argument. Targetted subsidies are likely to be a more successful means of assisting the transport disadvantaged than are general subsidies.

(xi) Option Value

This argument is that public transport subsidies enable the provision of services that are a back-up transport service to those who normally use cars. This back-up characteristic has a value to the community, referred to as an option value in the economics literature. The theoretical basis for the argument is weak, and no attempts at measurement were found in the literature.

(xii) Merit Good

This argument is that public transport is a merit good, and therefore deserves subsidy. A merit good is one that has some qualities that are inherently "good", and if its price was not subsidised it would be under-consumed. The argument does not have a sound basis in theory, and no attempts at measurement were found in the literature.

(b) **Arguments Against Subsidies**

(i) Technical Efficiency

The basis for the argument that subsidies increase costs is strong, being based in regulatory theory. Several studies in the United Kingdom and the United States indicate significant leakage of subsidy to higher costs. This may not be an argument against subsidy per se, but simply an indication that subsidy programmes should be designed to ensure cost control is paramount.

(ii) Cross Subsidy

The economic argument against cross-subsidy is that it leads to misallocation of resources as prices do not reflect costs. The measurement of the effects of the misallocation caused would be difficult and the literature review did not reveal any attempts to do so. Subsidy does not have to be associated with cross-subsidy. If prices are based on marginal costs to achieve allocative efficiency, then cross-subsidy will not occur.

Evaluation of Arguments

The analysis of the arguments for subsidies identified a number of arguments which had good or moderate theoretical soundness. These arguments were then subject to further evaluation in terms of the objectives associated with public transport subsidies. These objectives are summarised in Table 2. The conclusions in respect of each of the arguments evaluated are summarised in Table 3. (The cost recovery objective is not included in the table as it conflicts to some extent with subsidy itself).

The overall conclusion reached was that public transport subsidies would have most success in meeting economic efficiency and equity objectives. The arguments for subsidy that are most likely to meet these objectives are:

* Economies of scale exist to the producers of urban public transport services;

* Economies of scale exist to the users of urban public transport services;

* Road congestion benefits require that public transport be subsidised;

* Public transport subsidies redistribute income to the less well off members of the community;

* Public transport subsidies provide mobility to the transport disadvantaged.

TABLE 2 : OBJECTIVES ASSOCIATED WITH PUBLIC TRANSPORT SUBSIDY

Category	Objective
Economic Efficiency	Allocative Efficiency Technical Efficiency
Cost Recovery	Full or specified recovery from users
Equity	Income redistribution Equal access to services User pays
Planning/Environmental	Fuel conservation Traffic safety Air pollution Noise levels Modal co-ordination Strong, vital central cities Maintenance of existing city forms

Source: (Travers Morgan, 1987, p.30)

TABLE 3 : POTENTIAL OF ARGUMENTS FOR PUBLIC TRANSPORT SUBSIDY MEETING OBJECTIVES ASSOCIATED WITH SUBSIDY

Argument	Objective Category		
	Economy Efficiency	Equity	Planning/ Environment
Economic Arguments			
Producer Economies of Scale	***	**	*
User Economies of Scale	***	**	*
Road Congestion	***	**	*
Social Arguments			
Income Redistribution	**	***	*
Improved Mobility	**	***	*
Land Use/Environmental Arguments			
Land Use Effects	*	*	**
Traffic Safety	**	*	*
Noise Pollution	**	*	**
Air Pollution	**	*	**
Fuel Conservation	*	*	*

Key: *** Most potential
* Least potential

Source: (Travers Morgan, 1987, p.32)

It was considered that the land use and environmental objectives were unlikely to be met to any substantial extent.

There are however a number of important qualifications to this conclusion. Firstly, the evidence indicated that the producer economies of scale argument would only be applicable to urban rail operations; and secondly, targetted subsidies were more likely to be successful in achieving income redistribution and mobility objectives than general subsidies.

Responsibility for Subsidies

Table 4 summarises the conclusions reached on central or local government responsibility for subsidies. The study concluded that while in some cases the division of responsibilities is arguable, central government had most responsibility for subsidies associated with allocative efficiency and equity. Subsidies which are associated with allocative efficiency are producer and user economies of scale and road congestion. Subsidies which are associated with equity relate to the income redistribution and mobility arguments. Those subsidies which have effects occurring only at the local level were considered not to be a central government responsibility.

TABLE 4 : CENTRAL AND LOCAL GOVERNMENT RESPONSIBILITY FOR SUBSIDIES

Subsidy	Central Government	Local Government
Economic		
Producer Economies of Scale	***	*
User Economies of Scale	***	*
Road Congestion	***	*
Income Redistribution	***	*
Mobility	***	*
Land use effects	*	***
Environmental		
Traffic Safety	**	**
Noise	*	***
Air Pollution	**	***
Fuel Conservation	**	*

Key: *** Meets criterion best
* Does not meet criterion well

Applicability to New Zealand

A general assessment of the applicability of the arguments for subsidies to New Zealand conditions was made in the study. This assessment is summarised Table 5. The main points arising from the assessment were that the road congestion argument was likely to be only of significance in the larger New Zealand cities and that it was unlikely that the existing subsidy system met income redistribution and mobility objectives.

TABLE 5 : APPLICABILITY OF SUBSIDY ARGUMENTS TO NEW ZEALAND

Subsidy Argument	Comment on Applicability
Producer economies of scale	Expected to exist in urban rail operations but not in bus operations.
User economies of scale	Expected to exist where scheduled public transport services are provided, however their level would be dependent on frequency and network density.
Road congestion	Would vary according to the size of the city and its topograhy and pattern of development. Not expected to be significant for cities smaller than Dunedin.
Land use effects	In accordance with overseas research, can be expected to be minimal.
Environmental effects	The relatively small size of these effects is not likely to be any different in New Zealand.
Income redistribution	It is unlikely that the present subsidy system meets this objective.
Mobility	It is unlikely that the present subsidy system meets this objective.

Further Research

The study identified the research tasks necessary to determine the level of subsidies for each of the arguments determined to be of some validity. These tasks are listed in Table 6. Priority was assigned to three research tasks:

- The development and operation of a second-best pricing model to calculate subsidies due to user economies of scale and road congestion benefits.

- The identification of transport disadvantaged groups and determination of subsidy levels to meet income redistribution aims and provide improved mobility to these groups; and

- The development of pricing guidelines for public transport operators who receive subsidy funds from the UTC, so as to ensure that subsidies do achieve the objectives on which they are based.

EVALUATION OF STAGE ONE FINDINGS

Basis of Subsidies

The research findings showed that there were five arguments for providing urban public transport subsidies which were most likely to meet national economic efficiency and equity objectives, (producer and user economies of scale, road congestion, income redistribution, and mobility). However the findings also showed that the present subsidy system was not well designed to achieve these objectives. Changes were therefore necessary if the UTC's subsidy system was to be placed on a sounder basis.

The UTC has therefore accepted the Stage One findings as a basis for further investigation in Stage Two. The environmental and land use arguments are not however being considered further at this stage as the findings indicate that they are unlikely to be significant and would require considerable research resources to investigate further. In addition the income redistribution argument is only being considered to the extent inadequate income is a

TABLE 6 : JUSTIFICATIONS FOR SUBSIDY AND RESEARCH TASKS REQUIRED TO MEASURE SUBSIDY LEVELS

Justification	Research Tasks	Priority
Producer Economies of Scale	Fixed costs of rail operations	Low
	Fixed costs of trolley bus operations	
User Economies of Scale	Public transport level of service elasticities	Medium
	Value of time	Medium
Road Congestion	Second-best pricing model	High
	Public transport level of services elasticities	Medium (as above)
	Values of time	Medium (as above)
	Public transport price elasticities	Medium
	Cross elasticity of demand for car travel with respect to public transport price	Medium
	Public transport costs by time and mode	Medium
Land Use Effects	Land values	Low
Environmental Effects	Accident costs by mode and time of day	Low
	Noise costs by mode and time of day	Low
	Air pollution costs by mode and time of day	Low
	Fuel usage rates	Low
Income Distribution/ Improved Mobility	Identification of transport disadvantaged groups	High
Subsidy Design and Administration	Pricing guidelines	High
	Investment guidelines	Medium
	Performance indicators	Medium

Source: (Travers Morgan, 1987, p.49)

factor relevant to the issue of mobility. Income redistribution was not considered by the UTC to be directly relevant to its functions, as it is not an urban transport matter.

Implications for Subsidy Policies

The main features of the UTC's existing subsidy policies are:

(i) To provide assistance to local authorities on a matching 50/50 basis;

(ii) To limit the qualifying expenditure for assistance to a percentage of the gross operating costs of the operator;

(iii) To treat all modes equally. (From 1985/86 to 1987/88 the UTC however fully funded urban rail deficits in accordance with Government policy).

A subsidy system based on the Stage One findings is likely to differ considerably from the present system. The main differences are likely to be:

(i) There would be no uniform percentage of subsidy provided as it would vary between areas according to the level of road congestion benefits, the extent to which there are user economies of scale, and the extent to which public transport is used by transport disadvantaged groups;

(ii) Targeted subsidies would be provided to achieve mobility objectives;

(iii) Subsidies would be related to performance to ensure that the availability of subsidies did not lead to increased costs, and that subsidies are used for the purposes for which they are intended;

(iv) The present matching dollar-for-dollar basis of UTC subsidy policies and system of deficit funding may no longer be appropriate;

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The key difference between any new system that is developed and the existing system would be that subsidies would be provided for a particular purpose or objective, and not the general funding of operating deficits as is the case at present. Operators who provide services in areas where traffic congestion is not significant and who do not carry passengers to which special assistance is targeted would receive no subsidy support. The main geographical implications of such a system for the distribution of subsidies is likely to be that only operators in the four main cities would receive road congestion subsidies. Outside the main cities the main subsidy source would probably be from targeted subsidy assistance for special passenger groups such as children and the elderly.

STAGE TWO RESEARCH

Although the Stage One findings showed that there was a basis for providing urban transport subsidies, primarily on economic efficiency and equity grounds, further research was necessary to establish the level of subsidies that could be provided on this basis. This research is being carried out in the second stage of the project.

Stage Two has been designed to demonstrate the type of subsidy system that could be established on the basis of the Stage One findings and to indicate the level and distribution of subsidies that it would involve. There are three main objectives to this stage:

"(a) To determine the level of subsidies that could be provided for urban public transport services in New Zealand on the basis of the following arguments:

(i) Economies of scale exist to the producers of urban public transport services;

(ii) Economies of scale exist to the users of urban public transport services;

(iii) Road congestion benefits require that public transport be subsidised;

(iv) Public transport subsidies redistribute income to the less well off members of the community and provide mobility to the transport disadvantaged.

(b) To make recommendations on:

(i) The best means of providing subsidies on the basis of those arguments, (ie. the subsidy delivery systems);

(ii) The proportions of subsidy that should be paid by central and local government;

(iii) What transitional measures, if any, need to be taken to assist in the implementation of the recommended changes;

(iv) Any other matters arising from the research which are considered relevant to the provision of urban transport subsidies in New Zealand.

(c) To establish the implications of the subsidy levels determined in (a) and the recommended subsidy system for existing urban public transport operators, given the current scope and the nature of the funding of urban public transport in New Zealand."

The achievement of these objectives will inform the UTC of the level of subsidies that could justifiably be provided on the basis of the arguments under investigation, the best means of providing the recommended subsidies, and the implications of the recommended subsidy system for existing operators.

A series of specific research tasks are being undertaken to achieve the project objectives. These are:

(a) The determination of the subsidy that could be provided for urban rail operations on the basis of the producer economies of scale argument;

(b) Further investigation of the user economies of scale argument;

(c) The establishment of a second-best pricing model to determine the level of subsidies that could be provided on the basis of the road congestion benefits argument, and to demonstrate the effect on subsidy levels of accounting for the user economies scale argument in the model. The model will be run for the four main centres and for a secondary centre to demonstrate its applicability to a smaller city;

(d) The identification of the potentially transport disadvantaged groups and what is the best means of providing them with assistance to improve their mobility;

(e) The development of pricing guidelines for public transport operators who receive subsidy funds from the UTC to ensure that the subsidies achieve the objectives for which they are provided;

(f) The development of a system of performance measurement directed to ensuring that the availability of subsidy does not lead to increased costs, and that subsidies are used for the purposes for which they are intended;

(g) The development of investment guidelines for urban public transport investment proposals and transport improvement works.

The project was commissioned in November 1987 and is due to be completed in June 1988. It is envisaged that any proposals arising from the project to change the present subsidy system would be introduced, at least in the first transitional stages, with effect from 1 April 1989. To achieve this the UTC will need to establish any new subsidy policies arising from the project by August 1988 in order to allow regional and local authorities adequate time to prepare their subsidy applications and for operators to adapt to the proposed changes.

At the time of writing Stage Two is proceeding largely according to schedule, however no definitive results are yet available.

CONCLUSIONS

The research being undertaken by the UTC on urban transport subsidies is a fundamental review of why public transport should be subsidised. It has shown that there are good reasons for subsidising public transport, primarily on economic efficiency and equity grounds, but that subsidies need to be carefully designed and delivered to ensure that they achieve the objectives for which they are provided and do not lead to technical inefficiency. The project has also shown that the present subsidy system does not have clear objectives and is not designed to ensure that cost control is paramount. These findings are likely to lead to the introduction of new subsidy policies in the near future which do have objectives and which are founded on a basis of research. These policies will probably result in a different level and pattern of distribution of public transport subsidies than currently exists in New Zealand.

The UTC's research programme is however only one stage in the policy development process. The acceptance and application of the research findings by the UTC itself, and by central and local government, will be dependent on the degree of change and the financial implications of the research findings. However, in the present climate of economic and public sector reform in New Zealand, and the fiscal constraints on Government expenditure, major changes in public transport funding can be expected as a result of this research.

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