LINKING MICRO- AND MACRO-ECONOMIC ASSESSMENT OF TRANSPORT PROGRAMMES

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ABSTRACT

There has been increasing interest in applying general equilibrium models of the national economy to the assessment of the economic impact of road-building programmes. This paper discusses why this has come about and potential advantages and pitfalls in achieving this result. The critical issue is that budget decision-making increasingly focuses on short term economic management issues rather than long-term economic development issues. The paper illustrates that assessing road construction programmes using short-term general equilibrium models would probably result in reduced road funding rather than increased budgets. It also illustrates that the research/development gap between micro-economic analysis (benefit /cost evaluation) and macro-economic assessment modelling is not daunting but reasonably achievable. What is needed is a transport-industry general equilibrium model which illustrates the long-term economic development impacts as well as the short-term economic management effects, so that this industry can be seen by economists in its true economic perspective.

TERMINOLOGY

In this paper the terms "micro-economic' and 'benefit/cost' are used interchangeably. The term 'trigger' means the nature and size of the initial injection to a macro-economic model.

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INTRODUCTION

Background

During the preparation of the 1968 Road Grants Act, benefit/cost analysis formed an important part in allocating Federal specific purpose grants for roads. Since then, although benefit/cost analysis is quite widely used as a check of viability of a road project and to assist in selecting road project priorities, it plays little part in determining the overall size of the road budget. It has generated little political or bureaucratic interest outside of the State Road Authorities and has been almost completely ineffective in retaining or increasing road-making budgets.

Instead, despite considerable development of these micro-economic evaluation tools, macro-economic models dominate the process of budget analysis.

Why has Benefit/Cost analysis of roads has failed to interest budget-makers?

There are three fundamental reasons for this change as follows:-

- **Transport economists do not address the range of issues needed by National Treasury economic planners and budget-makers**
- Even if they did **the beneficial effects of roads appear mainly in the long-term** and the short-term economic impacts of road programmes may be generally in conflict with the needs of National economic policy, which seems to increasingly focus on short-term issues, and
- **Benefit/Cost analysis has generally not been done well enough**

This paper explains these problems and aims to provide directions for research and development emphasis to overcome them.

ISSUES IN THE NATIONAL BUDGET STRATEGY

How do Treasury officials prepare the National Budget?

The principle interest of National Treasury officials is to move towards steady growth using indicators to provide guidance on current economic realities. These indicators are to assess:-

- effective full employment,
- low inflation,
- a balance in overseas payments and earnings or BoP equilibrium,
- low and stable interest rates,
- social equity,
- controlled, environmentally sustainable growth, and
- private sector involvement and responsibility

There are two analytic weapons with which these officials analyse the boom-bust cycle and thereby learn how to control the economy to achieve these aims. They are:-

- **Short-term general equilibrium models** of the whole economy, which simulate the linkages between the pricing, input-output and investment behaviour of key industries, and which provide estimates of the above economic indicators, and
- **Long-term structural adjustment** concepts and policies such as promoting free trade, deregulation, work-place training and 'user-pays' philosophy.

Recent interest in transport economics has focused on linking micro-economic analysis to the available short-term general equilibrium models in order to allow transport investment programmes to be evaluated in terms of the above economic indicators. This is aimed to provide a better medium for communications with National economic planners and thereby to assist in improving transport investment budgets.

WHAT IS WRONG WITH CURRENT BENEFIT-COST ANALYSIS?

There are two parts to the answer to this question

- the output criteria are very limited and inappropriate to budget strategists, and
- benefit/cost analysis is not often done well.

Why are the output criteria limited in usefulness?

Benefit-cost analysis aims to provide three output evaluation criteria - Benefit/Cost (B/C) Ratio, Internal Rate of Return (IRR) and Net Present Value (NPV). These purport to measure the impact that the road improvement has on the national economy and provide decision criteria for their priority. However, there is no attempt to measure the impact on full employment, inflation, balance-of-payments, interest rates, environmentally sustainable growth, or private sector involvement, which are the indicators of primary interest to budget strategists.

It should be no surprise, therefore, that benefit-cost analysis has virtually no influence on the gross allocation of road funds in the national budget but is relegated, at best, to the allocation in their priorities within a fixed budget.

What is wrong with the way some operators do the analysis?

Benefit-cost analysis is often carried out where the 'benefits' are solely seen as savings in Vehicle Operating Costs, savings in travellers' or freight time, savings in road accidents and/or savings in road maintenance (see NSW TREASURY (1988)). Not only is this form of analysis narrowly focused but it has been shown to be misleading and incorrect (see NAIRN (1989))

These benefits are usually over-estimated by assuming there is no generated or induced travel, which would offset or even negate the 'savings' in vehicle operating costs, accidents, maintenance and time.

Benefit-cost analysis is often carried out for a single length of road in isolation, say using HDM III or similar software (see THAWAT WATANATADA et al (1986)) yet the number of occasions when this simplification is acceptable is relatively few and, even then, the assumption is infrequently explicitly justified. The analysis should be done in a full network context so that travel and freight pricing can be estimated correctly in an origin to destination context so that:-

- changes in travel and freight pricing can be properly used to assess generated or induced travel and freight generation;
- the effects of inter-modal and inter-route diversion can be properly assessed; and
- the 'programming problem' can be resolved, whereby the benefits of competing or complementary projects are not arithmetically additive.

Network analysis is no longer a problem and some analysts carry out benefit-cost analysis in a full network context (see SATS (1974)). This allows changes in travel and freight prices to be related to induced output in the tourism and rural industry sectors. The use of the CARTS model in Australia and Papua New Guinea are examples of this. (see TUDGE (1994) and NAIRN (1988, 1991)).

Nevertheless, as far as final economic evaluation criteria are concerned, these improved techniques still only provide the traditional outputs - B/C Ratio, IRR and NPV. However, they can be extended to provide estimates of the induced regional output of the tourism, freight and rural industries and their regional distribution. This provides an important link to the development of linked micro- and macro-economic models and will be discussed further.

MACRO-ECONOMIC MODELS IN GENERAL

What are general equilibrium macro-economic models?

General equilibrium (CGE) models of economics vary but have at least some of the following characteristics:-

- They portray and balance the overall components of the Gross National Expenditure (GNE) equation, that is private and public consumption and investment expenditures and import and export expenditures, to provide an estimate of Gross National Expenditure or Gross National Product (GNP).
- These components are disaggregated by industry sector (the complexity of the grouping varies between models).
- As the input for one industry is either the output from others or an import, the model links them together using input-output elasticities
- Each industry has different employment/expenditure or investment/expenditure characteristics with different time lag responses. Therefore the time pattern, scale and mix of response to new expenditure/investment stimuli differ significantly.

- They incrementally (usually quarterly) apply these elasticities to assess how quickly, and to what extent, an initial growth or shift in expenditure impacts through different industries. The models iterate these time-lagged multiplier effects until the model converges back towards equilibrium. (Typically the ripples of multiplier disturbance slow down quite quickly).
- They sum the total expenditure, investment, exports and imports again to establish the gross impact on the whole economy and assess changes in employment, balance of payments, etc. at the same time.
- They provide intermediate and final forecasts of output, employment, balance of payments, capital formation etc. on a quarterly basis for several years ahead so that Treasury and Finance officials can assess the probable effects of changes in economic policy measures.

This description fits the types of models normally used by budget strategists with short-term interests. Variants to models of this general description include long-term models and multi-regional models, which have been used for specific purposes.

These models are usually developed by economic centres in universities, economic research institutes or consultants for the use of treasuries, reserve banks or planning agencies but are now increasingly of interest to private banks and other major firms or industry associations. The data for the various components of these models is normally supplied by quarterly ABS surveys and the models themselves need to be continually updated - some components being updated quarterly, others are updated less frequently - for instance the input-output tables are updated every three years. Because of this need for continual updating, the market has dictated that the several suppliers should provide the updated model every quarter (or so) as part of the licence fee.

MACRO-ECONOMIC MODELS AND ROADS

What has been done so far?

In 1993 the Australian Automobile Association commissioned the Allen Consulting Group and Swan Consultants for a study of the economic role of land transport infrastructure. For this purpose they used the ORANI model and, as well as the construction expenditure, applied another trigger being the improvements in industry productivity due to time savings from road improvements. (see THE ALLEN CONSULTING GROUP (1993)).

Not surprisingly, given this definition of a trigger, urban freeway or arterial road programmes showed up better than rural road programmes, which would have been more responsive to an impetus based on changes in freight prices. This led directly to the conclusion that more funds should be spent in urban areas than rural.

During 1994 AustRoads commissioned a study, the report of which has not been published, to assess the research and recommend changes that would lead to the reporting of the full macro-economics dimension of benefits from investment in roads.

It is understood that the consultants used the Access Economics AE-CGE model and applied it, in a similar manner to the Allen method, to the construction phase of road investment, but adapted the model to measure 'medium-term' effects of on-going benefits.

However, it is widely understood that the analysts assumed the primary aim of AustRoads stakeholders to be the efficient use of available road funding resources, rather than the appropriate level for the allocation of funds for roads. This assumption inevitably led to the report recommending against any major role for macro-economics modelling except for very large projects. If this approach is true, then it is a narrow and unfortunate perspective. If those whose primary function is the provision of an efficient road system do not address the issue of the total allocation of Federal and/or State funds to road programmes, then it is surely inevitable that they will not participate authoritatively in any discussion of relative funding priorities. Without this negotiating power, they must then face the risk that funds will diminish. In any case, the issue of efficient allocation of available funds is but a sub-set of the efficient allocation of State or National funds and the same techniques should be capable of being applied to both objectives

In 1995 an application of macro-economic modelling to the VFT project, together with the Allen report referred to above, were reviewed and assessed in BUREAU OF TRANSPORT AND COMMUNICATIONS (1995)).

What problems need to be overcome in this work?

The most common and well-known commercially available general equilibrium models of the Australian macro-economy, which have industry disaggregation, are the ORANI, AE-CGE and the MURPHY models. These models are highly credible and are widely used by budget strategists. However, as they stand, these off-the-shelf models do not have quite the ideal qualities needed for the evaluation of road projects or programmes.

The first problem is that **the commercially available models are normally used as short-term models** and do not focus sufficiently on important longer term effects. This comment is said to be less true of the MURPHY model which was designed from the outset to have specific long-run properties. Nevertheless, they are normally used to simulate or forecast the impacts of economic policy measures for quarterly periods for a term of several years to a steady state of equilibrium. This is not so much a characteristic of the models themselves as a comment on their calibration and use for clients with short-term interests

When applied to a road-building programme, this means that the emphasis in their use would be to capture and simulate the short-term impacts of the road construction expenditure programme. They would not necessarily capture on the longer-term impacts, which are derived from the impetus to industry provided by freight price reductions, which usually take longer than a few years to be realised even partially. For instance, the stimulus to the cattle industry from removing uncertainty of being bogged or cut off in rain on country roads, may take several years to eventuate while cattle numbers grow

This short-term emphasis is very unfortunate because the economic impetus given to primary or manufacturing industry from reduced freight prices is usually much more valuable than the direct impact of road construction itself.

The second problem is that, with the exception of a model developed by the National Institute of Economic & Industry Research, **the existing models have no detailed geographic dimension** and therefore cannot distinguish the impacts of roads in different areas. They can be applied at State level but cannot respond to the differences in economic impact between a road construction dollar spent in one area of the State from the same dollar spent in another area. For instance, a dollar spent on roads in Cobar will have a very different effect on the National or State economy than a dollar spent on roads in Newcastle - the industry structure is different, prices are different, employment issues are different, export expectations are different and the social equity environment is different. Micro-economic analysis at least aims to relate the location of a road to the location of its affected industry even if it cannot cope with these other issues

The third problem is **inadequate identification of road impact triggers**. In the above models the road construction and maintenance industry is not a unique or exclusive industry but is typically aggregated with other construction industries. Similarly, freight prices are not segregated within the costs of production and distribution. What is needed is a model which focuses fully and clearly just on road building impacts and freight price reductions as the initiating event and is not lumped together with irrelevant other industries.

Are these problems difficult to overcome?

There are many examples showing where these problems have been overcome. The development and application of long-run macro-economic models has been achieved and the effective application of long-term macro-economic modelling is well illustrated by examples such as the use by Adams of ORANI or McKibbon's MSG2 model or the model of the Reserve Bank of New Zealand reported in HARGREAVES (1992).

The geographic problem has been overcome by sub-categorising each industry group into regions and inter-regional econometric models have been used in Australia. For instance, The National Institute of Economic and Industry Research have built a hybrid multi-regional macro-economics model with Statistical Divisions as regions.

There is no need to attempt impossible detail in defining the intensity of geographic sub-categorisation in the model. The geographic definition of regions used to sub-categorise each industry group does not need to have the same intensity as that for the zones used to derive the freight price changes and initiating industrial impacts. If, for instance, 200 zones were used to describe New South Wales in a CARTS model used to derive freight price changes, it would be quite sufficient to sub-categorise New South Wales industry into regions based on Statistical Divisions (about the same as Local Government Areas) for the macro-economic model. The gain in descriptive power of a regional model of this type would far outweigh the loss of accuracy by making such a geographic approximation.

The principle problem of combining a multi-regional model with a longer term model is that labour mobility issues need to be accommodated so that changes in regional employment will be reflected in the results. There are many examples of such models in the literature, the most successful and practical being 'hybrid' or 'bottom-up' multi-regional models, where there is full inter-action between the National and the Regional model components. (see BODKIN (1991)).

Finally, splitting the industry groups to provide custom-made macro-economic models presents no conceptual problems and is really only a matter of further data segregation This was done in the Allen/Swan study and the AustRoads work although, in my view, a better identification of appropriate triggers would have provided a better split and more reliable results.

What answers are likely from using a short-term model?

If the regional and industry-splitting problems are overcome, the implications need to be recognised of the propensity for budget strategists to use macro-economic models over the short-term only. The likely outcome of such an analysis of the impacts of an increased road construction programme using a macro-economic model **is not expected to be favourable.** For instance:-

- Increased road expenditure would **influence balance of payments** through the current account. As road construction has a high import component (about 30% being imported fuel and machinery) and no export component **in its own right**, then its short-term impact on the current account would be negative and the national debt would increase. The national debt is currently seen to be the largest single economic problem facing the nation and is the fundamental reason for the drive of the Federal Government to balance the budget.

  But, as a net fuel importing nation, we should expect longer term benefits from fuel savings which result from improved road conditions. However, if the same road improvements generate more travel, it is not clear whether the effect on fuel consumption would be favourable even in the long run.

  As reduced domestic freight costs are likely to act as a stimulus to industry, by making export industry more competitive, then there could be a long-term beneficial effect on the current account However, since reduced domestic freight costs influence both import prices as well as export prices, it is not immediately obvious that there is a long-term balance-of-payments impact from reduced road freight rates. It is required to be illustrated that there is a longer term impetus provided to the export-oriented beef/cattle, wool or tourism industries in rural areas and an import-substitution impetus to manufacturing industries in urban areas

- Increased road construction expenditure would probably need to be financed mainly through loan funds and would, by increasing demand for these funds, **tend to increase interest rates** or worsen the capital account balance unless funded by diversion from other sectors.

However, it is to be expected that, in the long-term, improved industry output and efficiency from reduced freight rates would generate savings and tend to reduce interest rates.

- A substantial increase in road construction expenditure would do nothing in the short term to **reduce prices and curb inflation.** If anything it would tend to increase prices in the industry until an appropriate level of competition was restored.

  In the long term it may lead to economies of scale and an important long-term effect is to reduce freight costs and, given a competitive freight industry, this would help to reduce inflation in many industries.

- Increased road construction expenditure would **generate employment**, but the comparative extent of this impact depends on the labour-intensiveness of road construction compared with other fiscal programmes. Road construction is not very labour intensive compared with, say, education or health care, therefore it would have less effect in reducing un-employment in the short term except in a spatial sense.

  In the longer term, however, the impetus given to the tourism industry, which is quite labour-intensive, particularly amongst youth, would have a strong positive impact on employment. Further, in the longer term, the impetus given to industry by reduced freight prices would generate wide-spread employment.

- Road construction is sometimes seen to be **offensive to a sustainable environment** because the construction process and associated quarrying disrupts wild-life and natural eco-systems and induced traffic means increased noxious gas emissions and noise. But relieving urban traffic congestion may reduce greenhouse and other emissions in the longer term.

- Road construction is sometimes portrayed as being **socially inequitable** because, in urban areas, it does not necessarily support the concept of a viable public transport system, or, in rural areas, it is said to detract from the ability of rail transport to compete.

  But urban buses benefit from road improvements and congestion relief and reduced road-borne input freight prices may well increase rail-borne industrial outputs.

- **Private industry is involved in toll roads** and this investment is generally, but not universally, welcome. The application of toll charges mean that less people use the toll road and its potential economic benefits are reduced compared with an equivalent untolled facility. Also the application of toll charges generates some adverse public reaction and toll operations are required to be monitored to protect the public interest, which involves a public administration cost.

  But, this private investment generates funds not otherwise available to the public sector so that roads can be built which otherwise would be delayed and it applies 'user-pays' principles in the long-term encouraging efficient structural adjustment.

- Finally, the outputs of the current short-term macro-economic models all relate to the National (or State) economies and initiating triggers cannot be specified with a regional identification nor can regional economic output criteria be generated.

Should the attempt to evaluate transport programmes by general equilibrium models be abandoned?

The above points are a bleak prediction of the answers obtained if increased road investment programmes were analysed only over the short-term. This is not to say that road investment is economically wrong, but that its beneficial effects are likely to appear mainly in the long-term and thus not find favour where short-term interests are dominant.

So the problem is two-fold. First, to properly link micro- and macro-economic forecasting models and then to ensure that transport investment programmes are fully evaluated and appreciated in the long term. This means building a greater political appreciation of economic indicators which illustrate long, sustainable and stable growth.

A SPECIFICATION FOR A MACRO-ECONOMIC MODEL FOR ROADS

What are the general specifications?

What is needed is a general equilibrium model:-

- which provides an evaluation framework over the entire period of a road's useful life and incorporates all of the economic impacts it initiates,
- that adheres generally to the components used by ABS for regional economies (such as the breakdown of industry categories in the input-output tables) as the model needs to be periodically updated from this data source,
- that, in addition, separately identifies key industries to customise the model to road industry needs,
- that is categorised by numerous regions or zones so that the economic value of road expenditures on different projects or programmes can be identified in its geographic or regional context, and
- that regionally responds to long-term travel and freight price changes and road-side industry impacts as much as road construction expenditures.

Which special road-related industries need to be exclusively defined?

Three industries are intimately tied up with roads and their users and these industries experience the first round effects of road building expenditures. The model should split these industries out of their more general industry group because it is possible to calculate their initial impacts from road investment using current micro-economic models. This would provide the appropriate link to these micro-economic models and improve the quality and understanding of the initiating impetus they give to the macro-economic model.

Increased direct expenditures in the **road construction industry** could already be addressed fully by the use of short-term macro-economic models provided that it is uniquely defined as a separate industry. These expenditures have short-term impacts only and need to be offset by the taxes or loans used to fund them at the State or National level. This was achieved quite fully in the work done so far, except for regional identification.

Increased direct expenditure on the **road freight and bus industry** also needs to be defined as a distinct industry impact. Savings in operating costs in this industry due to improved roads may be retained as profits or passed on to freight forwarder consumers in the form of reduced freight prices. The reduced freight or travel prices may induce added production output in this industry and/or serve as a primary trigger to increased output in other industries. While care must be taken in avoiding double counting, the effects of reduced freight and travel prices are long-term or permanent and they should be treated in this way in the model.

It is not sufficient to estimate time savings and use these as an indicator of industry productivity gains. This technique, used in the Allen study, is too crude. Freight and travel prices are much better and can be regionally identified and applied.

Increased direct expenditure on the **road-side service industry**, including maintenance, also should be identified as a separate and distinct industry impact in order to focus the outputs of the required model. The direct effects of increased fuel sales, vehicle repairs, road-side food etc. due to induced travel can be identified locally and fully by existing models such as CARTS (see R J NAIRN AND PARTNERS (1994)). This may include reductions in fuel use from smoother road surfaces or increases in fuel use due to induced traffic. These impacts are ongoing and need to be included in a long-term model.

These industries experience the first economic impacts of increased road programme expenditures and therefore act as the trigger to the adjustment cycles in the macro-economic model.

Which other industries are affected by travel or freight price reductions?

Because of the inter-dependencies in the input-output model, all industries are capable of being influenced by changing freight prices. Some are affected significantly, and quickly, some by a large amount but slowly and some are barely affected. In each case the effect is permanent or long-term. The model needs to establish these dimensions.

How do we know the amount of inter-regional, inter-industry freight movement?

Statistics for inter-regional road freight movement in Australia are very difficult to obtain but it is necessary to have reasonable estimate of these movements in order to establish the size of the effect of inter-regional freight price changes. The Transport Research Centre at Wollongong University has been providing origin-destination matrix data by commodity for road freight movements in Australia by isolating road freight as the residual after deducting rail, air and sea freight from overall interstate freight statistics and then distributing origins and destinations in accordance with known producers/users of freight.

The inter-regional, inter-industry change in freight expenditure can be measured using a combination of freight price changes obtained from regional transport network models such as CARTS and these freight movement matrices. In other words the quantity of freight moved by particular industry groups in particular districts to other districts can be multiplied by the average freight price reduction for that inter-district movement thus providing the economic trigger for impacts on those industries in the general multi-regional equilibrium model.

What about induced population shifts?

A long-term, multi-regional macro-economic model needs to simulate labour mobility so that changes in regional employment will be reflected in the results. However, one of the long-term potential effects of the implementation of major roads is population relocation. The economic effect of population migration induced by road building has been assessed using the CARTS model (see TUDGE (1994)) and it would be desirable if this feature were also built into a combined micro- and macro-economic model of the road industry.

Does the model stop with these impacts?

No. Unlike benefit-cost analysis, these initiate secondary changes or multipliers. If, say, steel distribution costs are reduced by freight price reductions, then less steel is imported, more is exported, motor vehicle manufacturing costs are reduced so car prices do not rise so quickly, building industry costs are reduced so there is greater interest in new housing and more building industry employment etc. These links between each industry are based on inter-industry input-output tables produced by ABS every three years.

How does the model stop?

After the initial impact, each round of impacts from each industry to all others becomes progressively smaller until, after sufficient rounds have taken place, the changes are so small that the model is considered to be in equilibrium (or a stable state) again. The model can be stopped when the change in the last round is say x% of the initial change and after all long-term effects have been incorporated.

Where do the time lags come in?

Each inter-industry impact has a response time associated with it. These range from almost instantaneous to significant lags. For example, a change in wool prices may take about three or four years to make an appreciable difference to the availability of wool because the flocks need to grow. The presence of time lags means that each round of impacts in the multiplier effects take place over different periods. This gives the model its time dimension. Some will be complete by the end of the first quarter but many will take several quarters or years to reach completion. Therefore we can assess the overall impact each year or so until the change each period has stabilised

What outputs would the model provide?

The model could potentially provide estimates of changes to economic indictors that result from road building projects or programmes as follows:-

- **Aggregate statistics for the Nation** - changes in economic output, employment, balance of payments and National savings/investment.
- **Aggregate statistics for a State** - changes in State output and employment
- **Aggregate statistics for regions** - changes in regional output and employment.
- **Statistics for different industries in a State or region** - changes in economic output, employment, imports, exports and saving/investment for different industry groups in a State or region.

THE VALUE OF INVESTMENT IN ROADS IN THE LONG TERM

Boom-bust cycles

National economic planning has not been very successful. We still get boom-bust cycles about every seven years and the recent recession was deeper than any experienced in the last sixty years. This is not the fault of the macro-economic models being used for simulation, but their failure, in my view, is due to the short-term focus in which they are usually employed

If we do our economic planning only over 1-2 years then we will always be concentrating on shifting our foot from the brake to the accelerator rather than on where we are going. We should be at least doing our economic planning over the span of a complete cycle so we can try to simulate and forecast the whole cycle and then learn ways to dampen its worst features.

Welfare Vs infrastructure investment

Reducing income tax and increased welfare stimuli have been considered to be automatic stabilisers during recessions because expenditure on welfare rises and taxes reduce automatically, thus fulfilling Keynesian notions for correcting the boom-bust cycle. However, experience has shown that increases in the national debt during a recession period have considerable adverse welfare consequences (on home-loan rates etc.) and are politically unsustainable

Most of the current policies for structural adjustment - tariffs, training etc. - have arisen from the need to correct our overseas trade deficit and encourage consequent labour mobility or multi-skilling.

Welfare expenditures have a very direct influence but they usually need to be repeated each year because they make no lasting change either to the recipients or the national economy.

Investment in road infrastructure does make a permanent change - in travel and freight prices. These benefits are permanent and fairly constant over the long-term, therefore they are good stabilisers. They assist long-term structural adjustment.

CONCLUSIONS

Benefit/cost analysis was already well-established in Australia when the first attempts at creating a macro-economic model of the Australian economy began about ten years later. Furthermore, those involved in roads financing were the ones most active in utilising these micro-economic methods (see LACK (1968)). Since then it has become a poor cousin to general equilibrium models. Indeed it was always constrained by arbitrary rules such as 'no multiplier effects allowed' or 'no employment benefits allowed' for the good reason that it was, at best, only a partial analysis of the national economy.

Unfortunately only a few practitioners have applied the research ideas and development that has taken place in benefit/cost analysis since the early 1970's but this deficiency has been completely over-shadowed by the intense development of macro-economic models, which have reached a position of total pre-eminence in credibility and influence with budget strategists; an influence which has not been rivalled nor tapped to any extent by the road industry in Australia. As a consequence, the real value of finance available for roads has dropped persistently.

It should therefore be no surprise that interest has recently developed in applying general equilibrium models of the national economy to the assessment of the economic impact of road-building programmes. Unfortunately, examples in the use of macro-economic models for measuring the effects of road investment, which have been undertaken so far, seem to been initiated in the belief that traditional benefit/cost analysis understates the benefits of road investment. This is not the point. Macro-economic models are capable of providing a much wider range of evaluation outputs which are of far greater interest to policy-makers.

This paper takes the view that linking benefit/cost analysis techniques to long-term, multi-regional general equilibrium models of the National economy can be achieved and suggests a development path. It stresses the need for a better definition of the initiating triggers based on travel and freight price changes, which can be measured reliably with existing micro-economic models.

It stresses a multi-regional approach because industry structure, prices and social environment varies greatly between regions - particularly between urban and rural regions or between outback and coastal regions. It is quite wrong to assume that road expenditures in one region provide the same stimuli as expenditures in another region.

It also stresses that such a combined micro- and macro-economic model should be a long-term model because the short run influence of road building would produce very different, incomplete and mis-leading results. This needs to be coupled with a greater realisation that investment in roads rather than expenditure on short-term welfare issues leads to economic stability and sustainable growth.

The critical issue is that budget decision-making increasingly needs to focus on long-term economic development issues. If this is achieved then the road industry can be seen by economists and politicians in its true economic perspective.

ACKNOWLEDGEMENTS

The author wishes to acknowledge the assistance provided by Rod Tudge, for helpful discussions on this topic, and Norman Fisher and Lisa Bowyer, who provided direct critical commentary and ideas during the preparation of this paper. The views expressed are the responsibility of the author alone

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