Contribution of transport to economic development: International literature review with New Zealand perspectives

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This paper is presented not as policy, but with a view to inform and stimulate wider debate.
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1. Introduction

1.1 Overview

The overall focus of this project on Economic Development and Transport is on New Zealand’s economic development, viewed in particular through a transport policy lens. The New Zealand and international literature reviewed in this document sheds light on transport challenges and on the links between transport and economic growth and development.

As this is an extensive topic, this paper concentrates on a limited range of specific questions that are seen here and in other developed countries as core to transport policy and which connect to other components of this research. These questions and our possible answers are addressed in the body of this review.

One central theme that emerges from the international literature is the need for care in drawing blanket conclusions about the economic impacts of government investment in land transport infrastructure.

Historically, improved transport technology and transport networks, through effects on transport costs, access and connectivity, have been major factors underpinning economic growth and opening up formerly isolated areas to people and economic activity. But for a country like New Zealand, with a well-developed transport system, the relative gains from further transport investments are likely to be much smaller than in earlier years. From a regional perspective, a key question is whether transport investments can be an effective catalyst for economic growth. The consensus from the international literature is ‘probably not’ — at least in the absence of other factors that can support economic growth in the region. Indeed, better transport can be a two-way road, by exposing relatively remote localities to greater competition from ‘imports’ of goods and services produced elsewhere and intensifying the pressures for movements of labour out of the area.

1.2 Project context and purpose

This paper is a contribution to the strategic project on Economic Development and Transport undertaken by the Ministry of Transport.

The purpose of this project is to provide advice (at a strategic level) to the New Zealand Government, through the Minister of Transport, on the likely demographic and economic development of New Zealand over the next 25 to 30 years. It then addresses the implications of this development for the New Zealand transport system, and in particular for the level and pattern of investments into the transport system to both support the likely pattern of economic development and enhance this development.

The project involves an overview report and the following four component papers:

(A). Economic development: a review of key themes in the international literature (2014)

(B). Future options for the New Zealand economy: model, data and futures (2014)
The contribution of transport to economic development: International literature review with New Zealand perspectives (2014) - this paper


Papers (A) and (B) were prepared by Professors Caroline Saunders and Paul Dalziel of the Agribusiness and Economics Research Unit (AERU) at Lincoln University. Paper (C) was prepared by Ian Wallis Associates and Paper (D) was prepared by Ministry of Transport staff (with input from the NZ Transport Agency).

The context for this project is the ongoing aim of the New Zealand Government that investments in the land transport system should support New Zealand's economic development. This has been one of three goals in the Government Policy Statement on Transport (GPS) for the last 6 years and is proposed in the draft GPS 2015 for the next 3 years and beyond. The draft GPS 2015 proposes an investment in the New Zealand transport system of $10.5 billion for the 3 years to June 2018, and $28 billion for the subsequent 7 years.

The prevailing view of economic development in New Zealand, which has shaped the New Zealand government's approach to policy, has been that government's role is to create the conditions for the success of business. It is not seen as the role of government to decide what type of businesses should succeed or where those businesses should be located. This creates a conundrum for the transport sector, as while the government policy is essentially place-neutral, investment in the transport network is by its very nature place-specific.

The first paper explores the international literature on economic growth and development; based on this thinking, the second paper then develops seven alternative economic development futures, differentiated by their location of population and economic activity across New Zealand's regions. This third paper examines the international evidence on how and to what extent investment in the transport system can contribute to economic development, at both national and regional levels, in a well-developed country such as New Zealand. Building on papers (B) and (C) in particular, the fourth paper outlines the implications of the seven alternative futures for the development of the New Zealand transport system, and in particular for future investment in the system.

All transport modes and connections can have a bearing on the pattern of regional development in New Zealand. However, in this paper we mainly focus on land transport, especially roads, given that these account for the majority of government transport spending.

1.3 This paper – scope and key issues

This paper comprises a review of international literature and research (principally relating to developed countries) on the relationships between transport investment and economic development, together with commentary on current New Zealand policies and practices in the light of this review.

The relationships between transport and economic development occur in two directions, in the sense that (i) land use and economic developments are major ‘drivers’ of demand for transport (in terms of
quantity, type, location and mode); and (ii) transport investments and other initiatives (such as regulations, pricing) can influence levels, patterns and locations of economic development. This paper is primarily concerned with the second of these relationships.

It addresses the influence of changes to the transport system, particularly those involving investment in new/improved infrastructure, on economic growth and development at both the national and regional levels. It examines the New Zealand Government’s roles in relation to transport policy, regulation and investments, and sets out its objectives in these areas. It also outlines current project evaluation (appraisal) criteria and procedures for transport projects in New Zealand and considers the extent to which these support the Government’s transport system objectives relating to economic development.

Consistent with the above broad scope, the paper sets out to address a number of questions relating to the relationship between transport investments and economic development at both national and regional levels.

1.4 Structure of paper

Following this introductory chapter, the remainder of this paper is divided into five main chapters, as follows:

► Chapter 2 – Transport fundamentals. This chapter provides an overview of the ‘fundamentals’ of the transport sector, at a generic level, covering its economic role and contribution, transport demand and supply aspects, and consideration of transport markets.

► Chapter 3 – Transport influences on economic development – theory and practice. This chapter outlines the mechanisms by which the transport system and its associated technology influences economic growth and development, primarily at the national level.

► Chapter 4 – Transport and regional development effects. Leading on from Chapter 3, this chapter examines the spatial impacts of transport system changes at a more local/regional level. In particular, it examines whether transport investment can play a major role in influencing the levels and types of developments in specific locations/regions, especially to encourage the development of less economically buoyant regions.

► Chapter 5 – Government roles and objectives in transport. In the New Zealand context, this chapter addresses government roles and objectives for the transport sector, and in particular its role and involvement relating to investment in new/improved transport infrastructure.

► Chapter 6 – Assessing the economic contribution of transport – approaches to project appraisal. This chapter compares, based on international literature and practice, approaches to transport economic appraisal that focus on economic welfare appraisal (such as social cost-benefit analysis) with approaches focusing on levels and patterns of economic activity (such as contribution to GDP). It then comments on current New Zealand transport investment appraisal practices in the light of these alternative approaches.

Various supplementary material, relating particularly to the review of international literature sources, is provided in appendices.
2. Transport fundamentals

2.1 Introduction

This chapter provides an overview of the ‘fundamentals’ of the transport sector, at a generic level, covering its economic role and contribution, transport demand and supply aspects, and consideration of transport markets.

The chapter is structured as follows:

► Section 2.2 – Provides an overview of the role of transport in the economy, both in general and in the New Zealand context in particular
► Section 2.3 – Outlines the economic contribution of transport from various perspectives
► Section 2.4 – Describes influences on the demand for transport and the factors affecting decisions on transport use in the business sector
► Section 2.5 – Outlines the various supply features of the overall transport system (infrastructure, vehicles, operations, institutional arrangements) and how these influence travel behaviour
► Section 2.6 – Describes the transport ‘markets’ that result from the interaction between supply and demand aspects and which are characterised by varying combinations of prices, service levels and quality factors

Within these sections, the chapter also addresses the following specific questions:

► What is the economic role of transport?
► What is the significance of the transport sector in the overall New Zealand economy?
► Do the effects of transport improvements differ according to the stage of a country’s economic development, and in what ways?

2.2 Overview of the economic role of transport

The principal role of transport is to provide access between spatially separated locations for the business and household sectors, for both commodity (freight) and person movements. For the business sector, this involves connections between businesses and their input sources, between businesses and other businesses, and between businesses and their markets. For the household sector, it provides people with access to workplaces and education facilities, shops, and social, recreational, community and medical facilities.

Transport may be regarded as an important sector of the economy in its own right: transport infrastructure provision and transport operations together account for about five percent of New Zealand GDP. Given the significance of the sector in economic terms, both the level of transport investment together with the amount of expenditure on transport operations can have wider effects on the economy (as is seen when transport fuel prices increase substantially, resulting in reduced household expenditure on other goods and services).

In New Zealand, the transport system is largely self-funded, in the sense that the majority of the costs of system investment, operations and maintenance are either paid directly by users (for example, through car operating costs) or are funded initially by governments and recovered from transport
users (for example, through petrol duties and road user charges (RUC)). There are exceptions to this ‘hypothecation’ approach, one of the main ones being the partial funding of local roads and local public transport services through regional/local rates.

The New Zealand transport system and its use also give rise to some external costs (‘externalities’). These include global environmental impacts (greenhouse gas emissions) and local environmental and health impacts (for example, noise, particulate pollution and road accident costs). Although some components of these externality costs are recovered from government charges on transport users and operators, it is not clear that all externality costs are recovered in this way.

The direct effects of transport investment are to reduce transport time and costs through reducing travel times, decreasing the operating costs of transport and enhancing access to destinations within the network. Transport investment may also mitigate any economic disbenefits, for example where projects reduce congestion or the risk of injury. These incremental benefits of transport investments may be measured through conventional cost-benefit analysis.

Other indirect consequences of transport investments should also be considered when evaluating projects. These include effects on productivity and the spatial pattern of economic development. In the long term, transport investments contribute to economic development by stimulating a variety of inter-connected economy-wide processes, which can yield spatial and regional effects that augment overall productivity (as discussed further in Chapter 3).

In particular, lower costs and enhanced accessibility, due to better transport links and services, expand markets for individual transport-using businesses and improve their access to supplier inputs. Increased access and connectivity create increased opportunities for trade, competition and specialisation, which can lead to longer-term productivity gains. These changes are analogous to the gains from lowering barriers to trade and the expansion of opportunities that come from doing so. Therefore, knowing the circumstances in which these impacts occur is an important part of understanding the economic benefits that may arise from transport investments.

2.3 Alternative perspectives on the economic contribution of transport

The economic contribution of transport interventions and transport policy can be assessed from various perspectives. These include:

► effects on aggregate economic welfare (that is, the sum of consumer and producer surplus), which is the focus of cost-benefit analysis, as applied to transport policies or projects
► micro-economic, for example, enterprise or household-level productivity effects
► macro-economic, for example, contributions to GDP, investment or employment, and the spatial patterns of economic activity.

Figure 2.1 indicates the broad relationships between transport interventions, funding, wellbeing and economic development. These relationships highlight a recurring theme in the literature, that transport investments can have multiple overlapping economic effects. They are reflected in government transport policies and in project evaluation methods, in New Zealand and many other countries.
As a contributor to economic development, transport infrastructure by its very nature has important spatial impacts, for example on intra-regional and inter-regional transport time and costs, and thus potentially on the location of households and businesses.

Transport services are produced and consumed jointly with transport infrastructure, a major component of the fixed capital of the transport sector.

A distinguishing feature of the transport sector is that its function is primarily as an input into many other activities. Firms transport products to distribution centres and retail outlets; businesses send their employees to meet with customers, suppliers, regulators and co-workers; people travel to work and for leisure pursuits.

However, the demand for transport cannot be treated solely as a derived demand. Improved access is a necessary (but not sufficient) precondition for increased productivity, and improvements in transport systems may themselves promote growth. The UK Standing Advisory Committee on Trunk Road Assessment (SACTRA, 1999) noted various ways in which transport can affect economic growth, for example through reorganisation and rationalisation of production, distribution and land use: and reducing labour costs by expanding catchment areas (refer to Chapter 3 for further discussion).

As will be discussed later, the link between transport and the economy depends crucially on whether firms are primarily consumers (users) of transport services, or whether firms use transport to change their production processes (or some combination of these roles).
2.4 Demand for transport

The demand for travel by individuals and households is essentially a function of their desire for physical access to workplaces, educational establishments, shops, and social, recreational and community facilities. The extent to which these desires translate into actual travel will be moderated by the time and costs involved in making the desired trip. Travel times and costs will be dependent on:

► the supply of suitable transport services, including speed, quality and convenience factors relating to the services (for example, service frequency, reliability, crowding)
► the financial cost (price) of the services
► perceptions of any social and environmental costs associated with the trip and the services involved (for example, level of safety and security, adverse environmental effects).

Transport demand decisions are complex, as multiple factors are involved, and both longer and shorter term choices need to be addressed. For example, for a company wishing to manufacture and then sell its products in the marketplace, it needs to decide on:

► the sources of its inputs, and how these are to be transported to its manufacturing sites
► the markets that it is best placed to serve, and how it will transport products to these markets.

This will involve medium-term decisions about whether it provides its own transport (and if so how), or outsources its transport task, and shorter-term choices such as the transport mode to be used, travel times and service quality features as well as price.

Historically, the ‘generalised costs’ (including travel time) of transport have tended to fall as a proportion of the total costs of goods and services, as transport technologies and efficiencies have improved. This reduction in transport costs together with growth in household incomes has resulted in transport becoming relatively cheaper for both businesses and households. This has been a major factor in increasing the demand for transport (per capita) over time. In the household sector, much of this increased demand has manifested through people making longer but faster trips, to take advantage of destinations and opportunities that would previously have been too difficult to access. The evidence indicates that the time that people spend travelling has varied very little in the modern era (averaging typically 60 to 70 minutes per day), but the distances travelled per person have increased substantially. In the business sector, the declining relative costs of transport have resulted in substantial increases in the transport task involved in manufacturing products and getting them to market, as business processes have been rearranged to minimise total production and distribution costs.

2.5 Production/supply of transport services

The production of all goods and services can be described using the concepts of inputs, outputs and technology. Inputs have to be acquired by the firm and combined to produce and supply outputs. In the case of transport, the firm has to use vehicles, terminals, rights-of-way, energy, labour and so on, to produce movements of freight or passengers, from many different origins to many destinations in various periods and at various frequencies.
The supply of transport services occurs through a combination of providing and using infrastructure across a range of modes. Provision of infrastructure incurs capital costs and covers, for example, roads, railway lines, airports and ports, while usage is made possible through vehicles (for example, cars, trucks, trains, aeroplanes and boats) and management systems (for example, traffic lights, signals, air traffic control, navigational aids).

It is evident that the ‘transport system’ is broader than just physical transport networks and vehicles. It includes institutional settings and the ‘soft’ systems that underpin the coordination of transport services. Figure 2.2 provides a diagrammatic representation of the transport system.

![Stylised diagram of the transport system](image)

Source: adapted from Lakshmanan and Anderson (2002), Figure 9, p.21

**Figure 2.2: Stylised diagram of the transport system**

From the viewpoint of those using the transport system, a key aspect of supply is its price, that is, the cost of using the transport system. The cost of transport to the user is conventionally discussed in terms of **generalised cost**. In transport economics, generalised cost is the sum of the monetary and non-monetary costs of a journey. Monetary costs might include fares, fuel and other vehicle operating costs, tolls and so on. The main non-monetary cost is the value of time devoted to the journey, which will be influenced by the reliability, quality and comfort conditions of travel.

The generalised cost of a journey will clearly depend on, among other things, the amount of congestion on the network, and may therefore vary by time of day and location. As for other goods
and services, the demand for transport will be inversely related to its costs as perceived by the users (not always the same as the full costs actually paid).

For business users of transport, deterioration in the supply of transport, leading to a rise in its generalised cost, will tend to raise the price at which businesses can supply the market. Similarly, an improvement in transport supply, leading to a fall in costs, will tend to lower the price. To the extent that these transport costs are passed on, the impact of changes in the cost of transport is felt by the purchaser of the final goods and services for which transport is an input.

Given that different areas have varying transport requirements for the distribution of products and/or the sourcing of inputs, the level of transport costs can influence the location of economic activity between towns, regions and even countries.

SACTRA (1999) noted that the supply side of the transport system can be altered in a number of ways, including decisions relating to the following:

► investment in, additions to, or improvements in, quality of the infrastructure stock (e.g. new roads or railway lines or rail electrification)
► replacement of existing infrastructure assets (for example, resurfacing a road or renewing railway track)
► reductions in road capacity
► better management of the asset base (clearing breakdowns faster, better management of traffic flows, new services making fuller use of existing infrastructure)
► changes in money costs (for example, tolls, parking charges, fuel prices)
► changes in regulations relating to the delivery of transport services (for example, changes in competition and regulations affecting entry to public transport and taxi markets).

2.6 Transport markets

In economics, ‘the market’ is an abstract concept. It is the interface between the supply of, and the demand for, a particular good, which determines the prices and quantities that are bought and sold.

In New Zealand, with the exception of rail services, most freight and passenger services are provided by the private sector, although public subsidies are common for urban bus and rail passenger services.

Transport is characterised by a profusion of markets for example, mode, localities, routes, service frequency and cost. For passengers and freight, degrees of substitutability vary between transport modes (often influenced by the distance between origin and destination). A large part of transport activity is transport for ‘own account’ (that is, provided and operated by the person/business making the trip, rather than by a specialist transport provider/operator). This is the case for car passenger transport, and also for a significant proportion of the road haulage market.

The operating environment in those markets has an important bearing on the conduct and performance of the transport sector, and in turn on outcomes such as affordability and safety. The government has a major role in shaping the operating environment, both through its dominant role in
infrastructure provision and through regulation and other policy settings.

Transport infrastructure funding and investment (refer further discussion in Chapter 6) is a major part of government's involvement in transport and a major lever applied to transport policy objectives and broader economic objectives. Governments, both central and local, are the major funders of transport and other infrastructure, so at the margin transport infrastructure is competing for political support with all other publicly funded programmes and projects (including social infrastructure such as schools and hospitals).

2.7 Conclusions

2.7.1 Main findings

This chapter has provided an overview of the role of transport within the economic system. While the principal role of the transport system is to provide access for both freight and person movements, between spatially-separated locations, transport is also an important sector of the economy in its own right.

The transport system is broader than just the physical network and the vehicles that use it. It also includes institutional settings and ‘soft’ systems that ensure the coordination of transport services.

This chapter has examined the supply features of the transport system, the factors that influence the demand for transport, and the characteristics of the transport ‘market’ that result from the interaction between supply (including price) and demand aspects.

Transport investments have multiple over-lapping economic impacts, which can be accessed from several perspectives: the initial impacts ripple through the economy both spatially and over time, manifesting themselves through changes in residential and industrial location, property prices, changes in the supply and demand for labour, and differential effects on the economy in any given area/region relative to other areas/regions.

2.7.2 Response to specific questions

What is the economic role of transport?

The transport sector is a major component of the wider ‘transport and communications’ sector; the communications sector includes telephonic and internet-based communications, which in some instances offer an alternative to physical transport. In other instances they are complementary to transport services.

The principal role of the transport system is to provide access between spatially separated locations, for the movement of people and goods. Improvements to the transport system commonly focus on reducing the generalised costs of travel (in both time and money terms). Such cost reductions improve the efficiency of the business sector, thus reducing the costs of goods and supporting expansion of the economy, and facilitate people’s access to employment opportunities, education facilities, shops, and social and recreational facilities.

Improvements to the transport system help to reduce the tyranny of distance, and hence the constraints of location for businesses and households. Such improvements are location-specific, and
will impact primarily on people and businesses in the region concerned (but also recognising that a substantial proportion of travel is inter-regional in nature).

**What is the significance of the transport sector in the overall New Zealand economy?**

The transport sector accounts for a significant proportion of the expenditures of both businesses and households in New Zealand, and it is also an important component of government expenditure and the national economy.

The transport sector (including the postal and warehousing industry) employs more than 85,000 people and accounts for some five percent of New Zealand GDP (Ministry of Transport Statement of Intent 2014–2018). Transport accounts for approximately 14 percent of the total expenditures of New Zealand households (Statistics New Zealand, Household Economic Survey, Year Ending June 2013). Transport also accounts for a widely varying proportion of total costs across different business sectors in New Zealand: in some sectors (for example, forestry) this proportion may be over 20 percent (Williamson, Philbin & Sanderson, 2012).

The New Zealand transport system (operation, maintenance and new/improved infrastructure) also accounts for a substantial proportion of total (national and local) government expenditures. The Financial Statements of the Government of New Zealand report Crown spending on transport and communications of $9.1 billion in the year to June 2014, which represented just under 10 percent of total Crown expenses. Expenditure on maintaining local roads is one of the largest components of total expenditure, in particular for many rural local councils.

It is noted that, to a large degree, central government expenditures on the transport system are raised from transport system users, through a hypothecated fund (the National Land Transport Fund), rather than from taxpayers in general.

**Do the effects of transport improvements differ according to the stage of a country’s economic development, and in what ways?**

Yes, the relative effects of transport improvements on economic and social connectivity are heavily dependent on the existing degree of development of the network and how well particular localities are connected to it.

The development of the transport system in the nineteenth century had profound impacts on the pattern of development and the growth of the whole New Zealand economy. This development of the transport system was itself the result of technological advances, mostly made internationally and subsequently introduced into New Zealand: these included the invention of the steam engine, which was used in steamships and railway engines, and of refrigerated shipping. These were game changers in reducing the tyranny of distance for New Zealand, both for domestic transport and for the ability to trade with other countries.

Now that New Zealand has more comprehensive transport connections both throughout the country and internationally, further transport improvements are likely to be more of an incremental (rather than game-changing) nature. In recent years, arguably the development with the greatest impacts in the transport and communications sector has been the internet together with major improvements and cost reductions in telecommunications.
3. Transport influences on economic development – theory and practice

3.1 Introduction

This chapter outlines the mechanisms by which the transport system and its associated technology influences economic growth and development, primarily at the overall national level (spatial/regional impacts are the focus of Chapter 4).

The chapter is structured as follows:

► Section 3.2 – Considers economic development theories at the general level and then examines how these concepts can be applied to transport.
► Section 3.3 – Summarise the history of technological developments in the transport sector and their major impacts on economic development.
► Section 3.4 – Addresses the mechanisms by which improvements to the transport system may enhance economic productivity and growth.
► Section 3.5 – Outlines the empirical evidence on the effectiveness of these mechanisms.
► Section 3.6 – Presents a summary of findings and conclusions from the chapter.

Within these sections, the chapter also addresses the following specific question:

► What are the mechanisms/pathways through which transport improvements influence economic growth?

3.2 Theories of economic development and the role of transport

One of the themes of the Agribusiness and Economics Research Unit (AERU) paper (A) was that countries can enhance their capabilities and outputs in three main ways, that is, by investment in:

► physical capital
► human capital (through education)
► new knowledge creation and application.

Economic output is a function of the capital and labour inputs used in the economy together with the efficiency with which these inputs are applied. Economic growth therefore depends on increases in these inputs and in total factor productivity (TFP).

Transport can be seen to have an obvious role here — both directly through investment in transport infrastructure, vehicles, and logistics systems, increasing physical capital; and indirectly through the impact that more efficient transport can have by inducing greater efficiency in the way that other sectors use their own inputs (refer section 4.4).

Early development models, notably Solow’s neoclassical growth theory¹, emphasised physical capital

¹ For references to the literature quoted in this section, see the AERU paper: Economic development: a review of key themes in the international literature (2014)
and technological progress (as well as human capital). But because of the evidence on diminishing returns to capital accumulation, the impacts of higher investment on the growth of the capital stock and so on output growth tend to dissipate over time. Therefore, in this framework higher investment leads to a rise in the level of output per head, rather than a permanent increase in economic growth.

In such models, trend growth in incomes per head would depend on growth in total factor productivity, which was regarded as an unexplained constant reflecting the impact of technological change.

More recently attention has turned to identifying circumstances in which diminishing returns to capital accumulation may not apply, so that growth rates can be influenced by investment in the longer term. In this context two different strands of endogenous growth theory have developed.

- One widens the definition of capital to include, for example, human capital and/or infrastructure as well as directly productive physical capital. Because of this broader definition, diminishing returns can be expected to be less severe, so that any boost to growth from investment takes longer to work through the economy and growth rates also take longer to revert to trend.
- At a deeper level, growth depends on incentives to invest and to innovate and these are captured by the notion of expected returns; that is, the expected flow of profits that will accrue to the decision-maker, as the driver of accumulation and endogenous innovation.

For the transport sector, the key question is whether improvements in transport provision are likely to encourage greater TFP growth by improving incentives for innovative activity (SACTRA, 1999). The mainsprings of long-run economic growth are investment and productivity growth. If transport provision is to have an impact it must work through these channels, either directly or indirectly, as a result of its effects on the decisions made by households and firms.

One of the main historical impacts of improvements in transport infrastructure has been to make possible and to reduce the costs of long-distance trade and so make markets more integrated. This is perhaps the aspect that makes transport infrastructure special; it may be achieved through better transport networks rather than individual transport schemes. In the presence of imperfect competition in transport-using sectors, it may also lead to important economic effects that are not captured in conventional cost-benefit analysis.

Transport and the economy are often said to have a two-way relationship; changes in the supply of transport may affect the level of economic activity and, conversely, the level of economic activity can affect the demand for transport (SACTRA).

This demand for transport is largely a ‘derived’ demand, arising from economic and social activities. For example, the purchase of goods and services by end users requires inputs to be transported to production centres, which creates a demand for freight services. The demand for passenger transport arises from the need for journeys to work, education, consumption centres and social needs.

Eddington (2006) reports that although it is evident from the academic literature that the transport system can impact on the performance of the economy, these impacts will be of different magnitudes at different times and in different places.
Transport activity and economic growth appear in the aggregate to be correlated, and assertions that improved mobility causes growth in the economy are common. This causality is important but difficult to prove. From a theoretical perspective, four relationships are possible: (i) changes in transport activity ‘cause’ changes in economic growth, meaning that travel is an essential component of and helps produce economic growth (and poor access and travel conditions can constrain potential economic growth); (ii) changes in economic growth ‘cause’ changes in transport activity, meaning that growth in the demand for travel depends on economic growth; (iii) the causality is bi-directional, meaning that each has an effect on the other; or (iv) there is no relationship, meaning that the fact that they have tended to grow in tandem does not imply that one causes the other (Ecola & Wachs, 2012). The evidence in New Zealand, supported by evidence internationally, tends to indicate that relationship (ii) is perhaps the strongest of the four possibilities. For example, the ANZ Truckometer indicator, which is based on heavy truck movements on the New Zealand road network, is a useful proxy for trends in overall economic activity.

Transport for London (2014) uses a supply and demand framework to assess changing travel patterns. Supply-based drivers may include changes in highway capacity, change in fuel prices and other vehicle operating costs, and public transport capacity and fares. Demand-based drivers include incomes, population and population density, and social attitudes and other factors affecting mode choice. In the broader New Zealand context, supply drivers also include changing freight costs (for example, through use of larger ships and trucks), and demand drivers include the growth of Auckland, changing post-earthquake transport patterns in Christchurch, and variations in regional economic activity.

Historically, transport has been considered as a primary factor of economic development. This has been particularly the case for developing countries, where the transition from a fragmented transport system to even a poorly developed network is of great importance (Hilling, 1996, cited in SACTRA, 1999; Owen, 1987). In this sense, the absence of a well-developed transport system acts as a serious constraint on growth.

In New Zealand, the early pioneering transport projects opened up localities to economic activities and to land uses that would not otherwise have occurred. The relationship was strong, and the direction was from transport to the economy more than the other way around.

Once a country’s transport system is better established, the emphasis is focused more on incremental improvements in the transport system when required by demand changes or when made possible by technological advances. The link between transport and the economy now becomes more complex and the strength of the various linkages becomes less clear-cut. These relationships are discussed further in the next section.

3.3 Historical role of transport developments in economic development

3.3.1 Historic transport developments

Historically, transport was a primary factor of economic development. This was the case in New Zealand’s early economic development, and it remains true in many developing countries where the
transition from a rudimentary, fragmented transport system to even a poorly-developed network is of great importance (Hilling, 1996, cited in SACTRA 1999; Owen, 1987). In this sense, the complete absence of a well-developed transport system acts as a serious constraint on growth.

Technological progress in transport, and the consequent capital investment, was essential to New Zealand’s early economic development. The key new technologies involved were the steam engine (hence steamships and railways) and refrigerated shipping.

► Much of New Zealand, and its agricultural potential, was opened up through the development of railways in the 1870s (associated with the Premier Sir Julius Vogel and financed by overseas borrowing). Before that only some coastal and riverside areas were readily accessible.
► Steamships lowered the cost and improved the reliability of links with the main overseas markets, improving the economics of agricultural exports and reducing the cost of manufactured imports.
► Refrigerated shipping allowed New Zealand to export more than wool, in particular meat and dairy products.
► In a more recent era, the Auckland Harbour Bridge opened up locations for economic activities and land uses that would not otherwise have occurred.

The new transport-related technologies and developments illustrated a very strong relationship between transport and economic developments (including land uses). The relationship was primarily based on transport’s contribution to the economy rather than in the reverse direction. Pioneering transport technologies offered improved access at lower cost and were consequently catalysts for economic growth — including steamships, refrigerated ships, diesel engines for trucks and trains, shipping containers, and modern truck technology.

In the transport sector, ongoing research and development internationally has produced major new inventions, such as those mentioned above, the diesel engine and the aeroplane, which have been greatly improved by subsequent innovations.

From a global point of view, these innovations were endogenous, while for New Zealand they were exogenous, paid for when we bought the equipment from international manufacturers. New Zealand applied such developments with transformational effects on the economy, such as efficient road freight transport across a nation-wide network, and a national air network.

These reduced the generalised costs of transport and increased opportunities for travel and trade. New Zealand’s own research-based transport innovations include remote-controlled rail shunting and the weight/axle weight/distance road user charge system (still a world leader).

One of the key issues for a small, geographically remote economy like New Zealand is the ability of local knowledge workers to access new knowledge being produced internationally. Hence international connections are vital, highlighting the importance of the country’s international airports (and its national air travel network feeding into those airports). More recently, access to new international knowledge has been greatly enhanced through the ‘explosion’ of information accessible via the internet.
Eddington (2006)\textsuperscript{2} included detailed studies of the historical significance of transport developments for economic growth and productivity. Eddington stated that “there has been a compelling link between the transport system and economic prosperity throughout history” and commented as follows:

\textit{History is full of examples of how transport networks have played a critical role in driving phases of particularly rapid economic growth. Step changes in connectivity, often associated with new transport (and more recently communications) technologies, have often been of particular significance."

The evidence shows that some of the most significant step changes in connectivity have included: the impact of canals upon the location of domestic production; the effect of international shipping routes in opening up early phases of world trade; the role of mass transit railways in the creation of cities throughout the world; and the impact of the completion of motorways and inter-state highway networks in the United States on productivity growth. Such inter-urban and international connections have permitted radical new production processes and allowed regions and countries to start trading in order to reap the benefits of increasing specialisation in the production of goods and services. The evidence is clear that, in the context of a developing economy, establishing basic connectivity is a very significant contributor to rapid economic growth.”

Box 3.1 reproduces additional material from the Eddington Report on the role of transport in supporting economic development of countries (UK and others) and regions (further material from and comments on the Eddington report is given in Appendix A3).

Box 3.1: The role of transport in supporting the economic performance of countries and regions

Step changes in transport connectivity have also helped shape the geography and economic performance of countries and of the regions and urban areas within them.

**Canals and the industrial revolution**

The expansion of the UK’s canal network in the eighteenth and early nineteenth centuries played a key role in the industrial revolution, providing much-needed connectivity between sites of industrial activity, urban areas and ports.

**Railways supporting export growth**

The expansion of the railways in the second half of the nineteenth century also delivered significant gains for developed economies. The head-start that railways (and their associated technology) gave to the performance of the UK economy should not be under-estimated. The welfare benefits to society from railways in 1865 have been estimated to be equivalent to some 4.1 per cent and 2.8 per cent of Gross National Product (GNP) for freight and passenger transportation respectively. Interestingly, the returns on creating a railway network have been estimated to be even higher in developing countries, such as Brazil, which had poor alternative transport links, than in more developed ones, such as the UK, where a well-developed canal network and extensive coastal shipping remained in operation.

**Transport influencing economic geography**

The creation of the transport network influenced the UK’s economic geography, i.e. the location of its economic activity. Canals were a primary factor in determining the location of industry. Although railways, which followed, had little impact on the location of industry, they revolutionised passenger movement and were critical in the creation and growth of many urban areas. The subsequent development of the strategic road network played a key role in the relocation of new, light industries, attracted by market access and new clusters. This was especially the case in the South East and is evident in the new industrial districts created around outer London, for example, those close to the A406 (North Circular).

**Development of urban areas**

New transport technologies were also fundamental to the development and the success of the major global cities in existence today. The role of transport in the success of the New York City cluster is summarised by Paul Krugman, who notes “...there has been no important commercial traffic on the Erie Canal since 1850, yet the head start that the canal gave to New York City has allowed New York to remain the largest US city to this day.”

Canals in the mid-nineteenth century were also critical in developing London’s comparative advantage in maritime services. The widespread use of passenger rail and the creation of the Underground system in the late nineteenth and early twentieth centuries reinforced the emerging economic and geographic trends still observed in London today.

In the past few centuries developed economies around the world have experienced step changes
in connectivity through new transport technologies: through widespread use of canals in the eighteenth and early nineteenth century; to steam ships and railways in the nineteenth century; to the development of affordable car travel and the completion of the strategic (motorway and trunk) road network in the twentieth century. The evidence is clear that in a developing economy context, establishing basic connectivity is a very significant economic contributor to rapid economic growth.


3.3.2 More recent transport developments

Once a country's transport system is more established, the emphasis tends to switch from quantum leaps to more incremental improvements to the transport system and its operation — as made possible by ongoing technological advances, efficiency improvements and regulatory changes. Infrastructure expansion may also be required in response to increases in demand.

The links between transport and the economy also tend to become more complex, with transport investment having to meet multiple objectives: these may include improvements in safety, travel conditions, accessibility, environment, integration and social inclusion. Therefore, an increased proportion of investment may be allocated for infrastructure (and other) schemes that address multiple objectives rather than solely maximise contributions to economic development. ³

The Eddington study ⁴ commented as follows:

In countries with well-established transport networks, where connectivity between economic centres already exists, there is considerably less scope for transport improvements to deliver the periods of rapid growth seen historically. Instead the debate for such countries, including the UK, should be focused on the capacity and performance of existing domestic links, and the addition of new links to support the growth and performance of the labour market in growing and congested urban areas. Increasingly, studies are suggesting that the efficiency with which existing transport networks are used is at least as important as the underlying level of investment."

So it can no longer be expected that the impacts of domestic transport improvements will be transformational in economies such as the UK. Instead, such improvements can have important impacts by releasing constraints on the economy. Since most developed economies have well-established infrastructure networks, the relationship between transport and economic prosperity is likely, therefore, to be a more incremental one. But, as the evidence of this study goes on to show, it is a relationship which is still of considerable economic significance."

Having considered domestic connectivity, it is also important to consider the rapid expansion of international passenger and freight connectivity in the light of historical experience. The most recent phase of globalisation appears to be driven by a rapid expansion in global

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³ This trend has occurred in New Zealand in recent years, as is described in Chapter 9.
connectivity, provided both by new communications technologies, and falling international transport costs. Could this current transformation in international connectivity represent another step change that will drive significant growth in the global economy? It is perhaps too early to judge and I do not claim to have a definitive answer to this question.

3.4 Transport system mechanisms for enhancing productivity and economic growth

3.4.1 Overview of transport system impacts on the economy

This section presents a summary of the evidence for the mechanisms by which improvements in the transport system feed through to the ‘real’ economy, to enhance productivity and economic growth. Much of this summary is drawn from UK publications over the last 15 years, as the UK has been at the forefront of theoretical research and empirical developments in this field over that period.

The Eddington Study (2006) provides a useful description of the relevant mechanisms. Figure 3.1 provides an overview (from the report) on the linkages between transport and economic performance: on the left-hand side it shows the direct impacts of transport interventions on the affected users (as generally addressed in transport economic appraisals); on the right hand-side it shows the various downstream effects that may occur in the economy in response to the direct impacts.

![Figure 3.1: Links between transport and economic performance](image)

Source: adapted from Eddington, R. (2006), The Eddington Transport Study, Main Report, Volume 1, Figure 2.3.

Eddington commented as follows:

"Transport has played a critical role in economic development but the historical and macro-economic evidence can only take us so far. To focus transport policy on where it will make a real difference it is crucial to understand: what users value from the transport system; the..."
mechanisms by which transport impacts on the economy; where transport may be the answer to economic challenges; and what the future implications are for the UK given its role in the world economy.

Good measurement of transport’s effects on the economy is of fundamental importance. The different mechanisms that underpin the relationship between transport and growth have been discussed at length in many previous studies and are the subject of a great deal of academic research. This study has sought to develop an understanding of those mechanisms which impact on GDP, in a way that can explicitly guide policy development and option generation to focus on the characteristics of the transport system that matter most to productivity and competitiveness.

The evidence is very clear that users want several things from the transport system, placing different weights on their relative importance. The key characteristics which are valued are: journey time, journey time reliability, cost, network coverage, comfort, safety and security (refer Box 3.2).

When users experience an improvement or worsening of these characteristics, they feed through to impact on the economy through a variety of mechanisms – increasing business efficiency, investment and innovation, improving the functioning of agglomerations and labour markets, increasing competition, increasing trade and attracting globally mobile resources. These ‘drivers’ are summarised in Box 3.2.

The earlier SACTRA report (1999) similarly examined the mechanisms by which transport improvements could, in principle, improve economic performance. It came to similar conclusions to the Eddington report, specifying the following six mechanisms:

► re-organisation or rationalisation of production, distribution and land use
► effects on labour market catchment areas and hence on labour costs
► increases in output resulting from lower costs of production
► stimulation of inward investment
► unlocking inaccessible sites for development
► triggering growth which in turn stimulates further growth.

Box 3.2: How transport impacts on the economy – the seven micro driver mechanisms:

► Increasing business efficiency, through time savings and improved reliability for business travellers, freight and logistics operations. A 5 per cent reduction in travel time for all business travel on the road network in Great Britain could generate around £2.5 billion of cost savings: 0.2 per cent of GDP.

► Increasing business investment and innovation by supporting economies of scale or new ways of working. The 2001 change in regulations that permitted 44 tonne trucks is estimated to have saved 134m truck km, £160 million of operating and fuel costs, and 135,700 tonnes of carbon dioxide.
Supporting **clusters and agglomerations** of economic activity. Transport improvements can expand labour market catchments, improve job matching, and facilitate business to business interactions. Transport’s contribution to such effects is most significant within large, high-productivity urban areas of the UK. London is the most significant example, adding 30 per cent to the time saving benefits of some transport schemes. Such productivity effects extend across commuter catchment areas, dropping away after forty minutes of travel time.

Improving the **efficient functioning of labour markets**, increasing labour market flexibility and the accessibility of jobs. Transport can facilitate geographic and employment mobility in response to shifting economic activity e.g. in response to the forces of globalisation, new technological opportunities, and rising part-time and female participation in the labour market. Nationally, transport improvements are unlikely to have a large effect on the employment rate, though may do so in some local circumstances.

Increasing **competition** by opening up access to new markets. Transport improvements can allow businesses to trade over a wider area, increasing competitive pressure and providing consumers with more choice. The UK is already well connected, so significant competition impacts are most likely to be felt from the integration of markets globally.

Increasing **domestic and international trade** by reducing the costs of trading. Since 1960, falling transport costs have boosted the international trade of goods by 10-17.5 per cent, raising UK GDP by an estimated 2.5-4.4 per cent. Domestic trade links are particularly important to the economic success of some urban areas e.g. the relationship between the financial services sectors in Leeds and London.

Attracting **globally mobile activity** to the UK by providing an attractive business environment and good quality of life. Such effects are of increasing importance but extremely difficult to quantify. However, the strategic focus of transport policy can be guided by the survey evidence which suggests that both domestic and international transport links can be important to attracting, retaining and expanding such activity, and that there is much commonality between the transport requirements of domestic and global firms.

See Volume 1 for more details on the sources of these estimates.


Additional commentary on this topic from the SACTRA report is provided in Appendix A.7.

O’Fallon’s (2004) review of the international literature on the linkages between transport infrastructure and economic growth summarised the nature of the underlying conditions that complement transport infrastructure investment and contribute to economic growth, as shown in Box 3.3.
Box 3.3: Summary of conditions complementing transport infrastructure investment to contribute to economic growth

**Economic conditions:**
- The presence of positive economic externalities (for example, labour market, network or agglomeration economies).
- The potential for economies of scale.
- The potential for specialisation of markets to occur.
- The availability of a good quality, skilled labour force.
- The availability of resources that "represent entrepreneurial effort that would not have occurred without the infrastructure being in place" (NCHRP, 1997, p. 8).
- The presence of inefficiencies in spatial structure.
- A generally buoyant economy.

**Investment conditions:**
- The transport mode being invested in.
- The availability of investment funds.
- Network effects (for example, is it a new link in an existing network, a new link connecting two ‘disjointed’ networks or expansion of a link in an existing network?)
- Scale, timing and location of investment.
- Efficiency in implementation.

**Political and institutional conditions** – related to the broader policy environment (the ‘non-economic’ factors) in which the investment takes place:
- Sources and method of finance.
- Presence of complementary or facilitative policies/action (for example, training programmes, structure of tax system, facilitating the entry of competitive and/or innovative firms).
- The organisational and managerial framework of the infrastructure facilities.
- The “political involvement of the political organs” (Banister & Berechman, 2000, p. 333).

Source: O’Fallon 2004 (refer also Appendix A4).

### 3.4.2 Impacts on business sector cost-efficiency

As noted earlier in this section, the Eddington report (2006) identified that transport system improvements result in various down-stream effects on the economy, one of which was the potential impacts on business efficiency (Figure 3.1).

Transport improvements can present firms with a range of opportunities to reorganise their production and distribution channels to achieve cost savings that could not otherwise be achieved. Lower transport costs may also present other opportunities, such as the ability to choose the most appropriate suppliers to improve efficiency, offer more competitive prices and compete for sales in more distant markets (SACTRA, 1999).
3.5 Some empirical evidence on impacts on economic growth

The previous section identified the mechanisms (and enablers) by which the benefits of transport system improvements can translate into increased productivity and economic growth. Having identified these mechanisms, this section addresses the empirical evidence on how effective such mechanisms (individually and collectively) are in practice, and in what circumstances. Unfortunately, the quantitative evidence on this topic is less than compelling and not at all consistent.

The UK SACTRA report (1999) examined this topic in some detail. It comments as follows:\textsuperscript{6}:

\textit{Theory suggests that there are a number of important mechanisms by which such transport improvements could, in principle, improve economic performance [refer to the list of six mechanisms in Section 3.4.1, page 21].}

\textit{Thus measures which reduce transport costs could encourage economic performance in various ways. Businesses can pass on the benefit of lower production costs to consumers in the form of lower prices, or they can implement further efficiency improvements by reorganising production and distribution. The economy can also benefit if lower transport costs help stimulate easier transfer between jobs, or greater competition among firms.}

\textit{We consider these theories, which deal with the linkages between transport improvements and economic activity, to be strong. They are internally consistent, and provide insight into a complex pattern of effects leading in different directions, not all of which are intuitively obvious - notably, for example, the ‘two-way road’ argument: this reminds us that improved accessibility between two countries (and, similarly, between cities, areas or regions) may sometimes benefit one of them to the disbenefit of the other. We emphasise that these theories as a whole should be subject to empirical testing before any of them can be taken as proved.}

\textit{In the search for empirical evidence, we find that direct statistical and case-study evidence on the size and nature of the effects of transport cost changes is limited. Some authors have claimed that national programmes of public investment, including road construction, lead to high rates of social return measured in terms of economic growth and productivity improvement. Other authors suggest that such effects do occur but on a smaller scale than has been claimed, and that, in general, any contribution to the sustainable rate of economic growth of a mature economy, with well-developed transport systems, is likely to be modest. Our investigations support the latter assessment. We have also reviewed available evidence from specific local studies seeking to detect economic impacts from completed transport investment projects in the recent past. The state of the art of this important field is poorly developed and the results do not offer convincing general evidence of the size, nature or direction of local economic impacts.}

\textit{Thus we are provided with a strong theoretical expectation that all or part of a successfully achieved transport cost reduction may subsequently be converted into a range of different}

\textsuperscript{6} SACTRA (1999) Transport and the Economy: Full report (pages, 7,8)
wider economic impacts. This, in principle, provides for the possibility of improved economic performance. Empirical evidence of the scale and significance of such linkages is, however, weak and disputed. We conclude that the theoretical effects listed can exist in reality, but that none of them is guaranteed. Our studies underline the conclusion that generalisations about the effects of transport on the economy are subject to strong dependence on specific local circumstances and conditions.

Eddington (2006) made use of and built on the earlier SACTRA report, and specifically examined UK and international evidence on the contribution of transport investment to increasing GDP, mainly at the national level. The study commented as follows:?

Whilst history demonstrates the importance of transport to productivity growth in the economy, the exact nature and scale of the relationship is much debated. Box 3.4 sets out some of the recent literature in this area.”

David Aschauer sparked the debate on the relationship between investment in public sector infrastructure and the performance of the economy in 1989. He found that for the United States economy a 1 per cent increase in the stock of public sector capital could boost GDP by 0.38 to 0.56 per cent annually. Subsequent studies suggest a much weaker link between infrastructure and growth. Although there is considerable variance in the empirical evidence, the studies are broadly consistent with the conclusion that a 1 per cent increase in public capital stock could result in a one-off, sustained increase in GDP of 0.2 per cent for a developed economy. The varying returns offered from these studies indicate the importance of targeting investment in the right places.”

Although many of these studies are informative and shed some light on the relationship between transport and the performance of the economy, it would be misleading for transport policy to be developed on the basis of these expected returns to GDP.”

In particular, there remains some ambiguity over the direction of causality in the relationship between transport investment and the performance of the economy. What comes first? Do countries choose to spend more on transport as they grow richer? Or does an increase in GDP come after transport investment, i.e. transport investment generates economic success? Our analysis of the literature and engagement with expert academics in the field suggests that, in practice, it is likely to be a combination of the two.

Such studies also omit the wider economic, social and environmental impacts not accounted for by the narrow definition of GDP. On balance, therefore, the above analyses may be underestimating the true magnitude of the relationship between transport investment and the performance of the economy. The Study’s view is that the link between transport and productivity is clear and is best demonstrated through the micro-economic approach.

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Box 3.4: A review of evidence on transport’s contribution to GDP

► A number of empirical studies have looked at the relationship between all public infrastructure investment and GDP growth. On average these studies seem to indicate a positive elasticity of output to public capital of around 0.20. Put another way, a 10 per cent increase in public capital stock increases GDP by around 2 per cent.

► However, there are limitations to these empirical studies and the results should be viewed with caution. OECD (2003) argues that early empirical work on the link between infrastructure investment and economic performance overstated the magnitude of the impact on GDP and productivity growth. In particular, studies that focus on public investment in capital and infrastructure in the broad sense, rather than on transport specifically, do not really distinguish between types of investment in terms of new build, upgrade, maintenance, etc., although some do make specific conclusions about the value of transport infrastructure investment, see below.

► Later studies using more complex modelling suggest a positive, albeit weaker, relationship between infrastructure and GDP. These include: Kocherlakota and Yi (1997), Demetriades and Mamuneas (2000), O’Fallon (2003), and Nijkamp and Poot (2004).

► Others assert that transport investment in particular has a positive impact on growth, these include: Barro (1991), Canning and Fay (1993), Easterly and Rebelo (1993), Kneller, Bleaney and Gemmell (1999), Victoria Transport Policy Institute (2003). Studies looking specifically at transport have offered more precise evidence: Nadiri and Mamuneas (1998) looking at interstate highways in the US found that the output elasticity averaged 0.08 from 1950 to 1991, suggesting that a 1 per cent increase in infrastructure stock increases GDP by 0.08 per cent. Crafts and Leunig (2005) illustrate that highways accounted for a third of all productivity growth in the 1950s and 1960s in the US (although this figure was only 4 per cent in the 1980s).

► However, such studies are often subject to the caveat on causality. The SACTRA Report to the then Department for the Environment, Transport and the Regions (1999) highlights the problem of understanding what is likely to be a two-way causal relationship, suggesting that although the theoretical links are strong, evidence is weak and by no means undisputed. OECD (2003) also suggests that, although the benefits of transport infrastructure to economic growth are generally recognised, a direct causal link is difficult to establish.

► Dodgson (1997) points out that empirical evidence to back up theoretical links is extremely hard to obtain and to interpret, because of the difficulty of determining cause and effect when GDP is influenced by so many other factors. Ebets (1999) concludes that there is no definitive estimate of the effect of infrastructure in general, or of transport infrastructure more specifically, on GDP.

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c See: Economic growth in a cross section of countries, Barro, 1991; The effects of transportation networks on economic growth, Canning and Fay, 1993; Fiscal policy and economic growth, Easterly and Rebelo, 1993; Public policy and the government budget constraint: Evidence from the OECD countries, Kneller, Bleaney and Gemmell, 1999; Transport Cost and
Some Australasian-specific estimates of the impacts of public infrastructure (not just transport) investment on GDP and other economic measures were assembled by Wallis (2009), and are shown in Table 3.1 below.

- The only New Zealand-specific estimates were from a wider OECD study by Kamps (2004), using vector auto-regressive (VAR) modelling. Kamps estimated a positive long-run elasticity for New Zealand real GDP for capital of 0.11, based on data for the period 1960 to 2001. However, this result was not statistically significant, even at the 68 percent level.
- The Australian results given in the table were all in the range 0.10 to 0.39, and mostly less than 0.20 (but without information on statistical significance in most cases): these results are considerably lower than Aschauer’s (1989) findings (above).

Table 3.1: Comparison of New Zealand and Australian evidence on responsiveness to public infrastructure investment

<table>
<thead>
<tr>
<th>Study</th>
<th>Study type and scope</th>
<th>Elasticity of variable with respect to public infrastructure investment</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>GDP/output*</td>
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<tr>
<td>New Zealand Results</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Kamps (2004)</td>
<td>VAR model, 22 OECD countries including New Zealand</td>
<td>0.11</td>
</tr>
<tr>
<td>Australian Results</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Kamps (2004)</td>
<td>VAR model, 22 OECD countries including New Zealand</td>
<td>0.29**</td>
</tr>
<tr>
<td>Otto and Voss (1996) (cited by Econtech 2004)</td>
<td>Australia</td>
<td>0.17</td>
</tr>
<tr>
<td>Pereira (2001) (cited by Econtech 2004)</td>
<td>Australia</td>
<td>0.17</td>
</tr>
</tbody>
</table>
### Conclusions

#### 3.6.1 Main findings

Our review of the literature, summarised in this chapter, on the influences of transport improvements on economic growth and development (principally at the national level) has found a large measure of consensus between researchers (all from developed countries) on this topic.

The main findings may be summarised as follows:\(^8\)

- In developed countries that already have a high quality, well-connected transportation infrastructure network, further investment in that infrastructure will not on its own result in economic growth. However, where the potential for economic growth is present, lack of investment can inhibit the potential growth. Investment in these circumstances should focus on ‘pinch points’ that would otherwise constrain growth. Transport infrastructure investment is a necessary but not sufficient condition for national (and regional) economic growth and development: it acts as a complement to other more important underlying conditions, which must also be met if further economic development is to take place.

- Evidence for a ‘special role’ for the effect of transport infrastructure investment on economic growth is limited. The high rates of return to transport investment claimed by some past studies are most likely the result of statistical correlation or other model specification issues.

- The incremental economic gains from investment in transport infrastructure in developed economies, above that needed to respond to demand, are likely to be modest. Arguably, there is a spectrum within which some developed economies may experience greater gains than others, but solid evidence to this effect is lacking.

#### 3.6.2 Response to specific questions

**What are the mechanisms/pathways through which transport improvements influence economic growth?**

These mechanisms have been investigated in depth, principally by UK researchers, over the last 15 years. The Eddington report (2006) showed how transport interventions initially affect the generalised

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\(^8\) Drawn from Banister and Berechman (2000) and Wallis (2009).
costs of travel for existing transport users, and that these cost reductions then translate into various downstream effects on the economy. Eddington defined seven categories of downstream impacts on the economy, which he called 'micro-economic drivers of productivity'; that is, business efficiency, business investment and innovation, agglomeration and clustering impacts, labour market impacts, increasing competition, increasing trade domestically and internationally, and attracting globally mobile resources.

We note that a substantial proportion of the benefits (as generally defined) of transport improvements do not affect the market economy, but take the form of socio-economic benefits to non-business users of the transport system, for example people making social and recreational trips, who will value the benefits from reduced travel times and better access in socio-economic terms, even though those benefits are not counted in GDP terms.
4. Transport and regional development effects

4.1 Introduction

The previous chapter outlined how the transport system and transport investments in particular influence economic development overall. This chapter leads on from there, in examining the spatial impacts of transport system changes, at a more local/regional level. As noted earlier, by its very nature transport infrastructure is essentially a location-specific type of investment, and so would be expected to have strongly spatially-focused impacts.

One reason for focusing on the spatial impacts of transport is that transport investment can play a major role in influencing the levels and types of development in specific locations/regions. This tends to be most prominent in metropolitan/urban areas, where inter-relationships between transport provision, land use and urban form are strong. A second (and related) reason is that transport investment is often regarded as one of the most effective actions that governments can take to boost the economies of less economically buoyant regions — through improving transport links both within the region concerned and to/from adjacent regions. This chapter examines the evidence in relation to both these aspects.

The remainder of this chapter is structured as follows:

► Section 4.2 – Outlines the spatial effects of transport, from an economic geography perspective.
► Section 4.3 – Provides a brief summary of the theory and mechanisms on how transport investment influences economic development at the spatial (principally regional) level.
► Section 4.4 – Summarises the (rather limited) empirical evidence on the impacts of transport investment policies on regional development.
► Section 4.5 – Outlines the interactions between transport policies, land use and urban form.
► Section 4.6 – Summarises the main findings from the chapter.

Within these sections, the chapter also addresses the following specific questions:

► Is it possible to identify in advance those transport projects that will contribute to economic development prospects and those that won’t?
► What can we conclude about the effectiveness of transport investments in enhancing economic growth and development in particular regions?

4.2 Spatial effects of transport – economic geography perspectives

The AERU review used an economic geography perspective to explore the relationships between the transport system and regional development. Its key findings on these relationships included the following:

► The new economic geography and the theory of agglomeration economics\(^9\) emphasises the additional productivity gains made possible through agglomeration in large urban areas.

Its literature (for example, Krugman 1991; 1998) shows that by reducing the cost of transporting goods between locations — which decreases the effective ‘distance’ between two points — transport improvements can promote trade, increase competition and variety, and facilitate specialisation in economic activities.

Infrastructure has an important influence on the location of economic activity and population centres. As per Straub (2008), infrastructure investment is by its nature spatial, since it involves rival choices about the location of services (including infrastructure) that will serve specific areas. Straub also noted that the new economic geography models help substantiate the claim that infrastructure policy is a form of industrial policy. Indeed, different types of investment have effects on economic activity that work primarily through their impact on business and industrial location and specialisation.

Infrastructure services are an input to both households’ and firms’ consumption and investment decisions. Changes in the availability and quality of infrastructure will crucially influence location decisions, for example migration of households and firms, establishment of new firms and fixed capital investment in different locations.

Economic geography models consider location patterns to be the result of the interplay between agglomeration and dispersion forces:

- Agglomeration forces arise as the result of increasing returns that may be either internal or external to firms. Increasing internal returns push firms to locate their activities in regions with bigger markets to be able to serve more consumers or where, through concentration of suppliers, the firm’s input costs are lower than otherwise. Agglomeration may also arise for reasons external to the firm, such as knowledge spillovers or access to a more highly trained workforce.

- Acting against these agglomeration forces are dispersion forces affecting both the supply and demand side of relevant markets. For example, agglomeration brings with it increasing costs of land and labour, as well as congestion. And locating in urban concentrations may mean neglecting distant markets.

- Transport costs are important in determining the balance between agglomeration and dispersion forces, as both forces diminish as transport and trade costs decline.

One policy trade-off arising from a geography and growth model is a spatial equity versus efficiency trade-off. This trade-off has two main consequences:

- First, infrastructure policies that facilitate transport between regions, for example building or improvement of major road corridors, will tend to increase both regional inequality and national growth.

- On the other hand, infrastructure policies that facilitate transport within poor regions will have the opposite effect of decreasing regional inequality, but also constraining national growth.
4.3 Influence of transport investment policies on regional development – theory and mechanisms

The previous chapter described a general structure outlining the way in which transport interacts with economic markets; while this provides a general indication of the relevant interactions, it leaves a number of key gaps in the analysis that need to be filled to provide better understanding of linkages and interventions in a spatial dimension. This section summarises these gaps and the related issues, in order to reach conclusions on the spatial influences of transport policies, particularly at a regional (or sub-regional) level. Based principally on SACTRA (1999), we itemise the main issues and then draw conclusions (refer also Appendix A.7 for additional material from the SACTRA report).

The main aspects of relevance are:

► how firms respond to transport changes (refer SACTRA 5.13-5.37 for further details)
► how labour and housing markets respond to transport changes (refer SACTRA 5.38-5.72 for further details)
► the role of agglomeration effects (scale economies and urbanisation) (refer SACTRA 5.73-5.101)
► the merits of modelling methods for estimating spatial impacts (refer SACTRA 5.102-5.127).

SACTRA’s appraisal of the various aspects identified the ‘two-way road problem’ as a key issue in attempts to promote regional development (typically in relatively disadvantaged regions) by means of transport investment within the region and between it and other regions. It concluded that: “improving transport links to a region identified as depressed or disadvantaged may result in investment and/or employment opportunities flowing into the region. However, equally, people, jobs (and perhaps investment) may flow out of the ‘target’ region due to improved access to other centres – through roads and other transport links”

In assessing the likely regional impacts (in terms of under what conditions transport investment will benefit the ‘target’ region and under what conditions an outward flow of investment and jobs would occur), SACTRA suggested the following key issues that would be relevant:

► scale economies (for example, where these dominate, lower transport costs through improved accessibility may encourage an increased concentration of firms in core regions, until the point that diseconomies sets in)
► size of the local market
► local land and labour conditions
► the nature of backward and forward linkages in the local economy
► the nature and scale of transport improvements

However, SACTRA also noted that the interplay of these factors is indeterminate — that is, it is impossible to predict outcomes using theory alone. It concluded that the impact of improved transport links on regional economies is context-specific and must be assessed on a case-by-case basis.
It stated that:\(^{10}\)

\[ \ldots \text{there is no guarantee that transport improvements will benefit the local or regional economy at only one end of the route – roads operate in two directions and in some circumstance the benefits will accrue to other competing regions.} \ldots \text{assessment of whether economy impacts will actually benefit the intended target area will need to consider impacts outside the immediate neighbourhood.} \ldots \text{greater attention should be paid to the question of where the impacts will occur and on whom they will fall.} \]

### 4.4 Influences of transport investment policies on regional development – empirical evidence

This section summarises the evidence available from international case studies (mostly from UK and Europe) on the impacts of new road schemes or road improvements on economic development at the regional and metropolitan levels. Its main focus is on empirical (before/after) evidence relating to situations where new roads have been built; but some of the evidence examined was from theoretical/modelling studies rather than direct observations. The evidence examined covers the impacts of new road schemes on land values, development pressures and actual development (including impacts on employment). Market research into the importance of transport factors in commercial/industrial location decisions is also noted.

The following are the main findings:

- New or improved roads that enhance accessibility of particular areas result in increased land values in these areas, whether the land is zoned for commercial, residential or other developments.
- The types of new developments which are particularly attracted to highly-accessible locations associated with new roads in peripheral urban areas (for example, land adjacent to motorway junctions) tend to be:
  - distribution/warehousing activities, serving national and regional markets
  - hypermarket and superstore developments that depend on large catchment areas
  - high-technology growth industries
  - offices requiring good access for employees and visitors, but not requiring central area locations.
- The evidence about factors influencing the location of commercial/industrial businesses is somewhat conflicting on the importance of transport factors. However, there is evidence that good road access is a major factor influencing such decisions.
- Improving access to under-developed areas with previous poor access does not necessarily increase the development of such areas relative to other areas. There may be employment gains in some sectors, losses in others (for example, the distribution sector). This is the ‘two-way road’ issue.

\(^{10}\) SACTRA (1999) Transport and the Economy: Full report (page 12)
Some theoretical (modelling) studies suggest that enhanced access may result in substantial increases in employment in areas with poor access previously, for example, the UK Severn Bridge/M4 study suggested an increase in employment in South Wales of some four percent. However such theoretical study results are often not substantiated by the empirical evidence — which tends to indicate much smaller impacts.

It is generally considered that improvements in accessibility to under-developed areas will not be a sufficient condition, and may not be a necessary condition, to stimulate economic growth in such areas. It is argued (Breheny 1995) that road investment will only make a significant difference where it is the only missing feature of a strong economy. New road infrastructure is likely to be more effective in stimulating development, in the context of a strong economy, where it removes a constraint to the spread of development pressures in the area/region concerned.

There is very limited evidence, from either theoretical or empirical studies, on the net effects (as distinct from the gross effects in the area directly affected) on the development /employment effects of enhanced access. In general, it is likely that most of the gross effects represent transfers from other areas.

Major new road schemes would generally ‘induce’ different patterns of land use development than would occur in the absence of a scheme. In particular, they may lead to rezoning of parcels of land in the vicinity of the scheme (for example, motorway intersections), which will be attractive to particular types of commercial development (as noted above). Such differential land use impacts should properly be taken into account when assessing the traffic, economic and environmental impacts of major road schemes.

4.5 Influence of transport policies on land use and urban form

4.5.1 Inter-relationships between transport, land use and economic development

Beyond the initial effects of transport investment on journey times and costs, labour market, agglomeration and transport network effects also influence the long-term impacts of transport investment on economic growth and urban/regional development. Each of these wider economic impacts has a spatial dimension through their influence on the location and geography of economic and social activity. These spatial impacts have a number of different dimensions. The first dimension is that the economic impacts may not be evenly spread. This means transport investment has the potential to cause redistribution of economic impacts between (and within) regions. Analysts should use caution when measuring benefits, such as new jobs created in one region, to ensure they are not miscounting redistribution as a benefit. The potential for redistribution is particularly relevant with inter-regional transport links.

A second dimension is that, in an urban setting, local transport investment plays an important role in shaping the aesthetics and amenity of a community. Transport infrastructure and services can have a significant impact on urban form by enhancing or detracting from it, leading to an impact on the attractiveness of a city as place to live, work and visit. This will in turn affect the economic dynamism and culture associated with the city. Therefore, transport investment can have long-term impacts on
economic growth and development, which go well beyond the initial benefits of travel time savings and lower vehicle operating costs.

Another dimension is that the economic impacts will play out via land use changes. For example, the construction of the Auckland Harbour Bridge had a significant effect on the economic development of the Auckland region in general and the North Shore in particular. Such wider economic impacts are well beyond what would have been captured in an assessment of the long-term travel time savings, reduced costs, and improved safety attributable to the bridge.

The impacts on land use and urban form are discussed further in the following section.

4.5.2 Implications for land use and urban form

‘Land use’ refers to the whole range of human activity and of the built environment, and to some aspects of the natural environment, outside the transport system itself (OECD 2002). There is a two-way relationship between land use and transport. As Litman (2014) reports “Transport planning decisions affect land use development, and land use conditions affect transport activity”.

Land use and transport interaction results in a cycle as illustrated in Figure 6.1 below. Transport improvements increase accessibility and so also increase land values. This in turn changes the land use, which often results in increased traffic volumes and levels of congestion, which may give rise to other concerns for the local environment, including air pollution, noise, ground-water pollution from run-off, loss of soil functions, and loss of bio-diversity. By influencing the spatial structure of locations in the urban environment, land use planning can help to mitigate any negative effects resulting from land use changes.

Modelling land use-transport interactions has become an important aspect of transport planning, particularly when a regional area or locality is being developed. Land-Use Transport Interaction (LUTI) models have been developed, but are dependent on considerable data and assumptions and need to be used with care.

There is strong evidence internationally that improvements in accessibility encourage agglomeration in urban centres, accompanied by increases in land values. This in turn results in increases in urban densities (for example, residents and jobs per hectare).

There is similarly strong evidence that these effects in turn influence the form of urban transport systems. Increased densities mean more destinations become within convenient walking and cycling distances, and consequently the use of these modes tends to be higher. Also, in denser cities public transport systems are able to offer higher levels of service and operate more economically, while the provision of sufficient road space to meet potential demand becomes impractical. The overall result is that, in the denser larger cities, a higher proportion of the overall transport task is provided by more sustainable transport modes (that is, walking, cycling, public transport) and the extent of car dependency is less. International data shows a very strong relationship between urban/metropolitan densities and levels of car (and public transport) usage (for example, Bachels et al., 1999).
This connection between urban transport and land-use development is a central part of the transport-orientated development initiatives in South East Queensland (Australia). South East Queensland is an example of a region experiencing rapid growth in population and consequently in infrastructure demands. The region’s infrastructure plan knits together social infrastructure, traditional utilities and transport. The region’s plans incorporate both transport as a means of facilitating development, and land-use planning as a means of reducing the demand for travel. The latter is achieved through integrated planning and providing support for transit-oriented developments.

A further aspect of the strong relationship between transport and urban form is the consequential costs of local or regional economic development. In Australia, the costs of alternative development paths — higher density urban redevelopment versus lower density fringe development — have been the subject of detailed investigation. A number of studies have assessed not only transport costs (incurred by governments and transport users) but also the costs of providing other infrastructure and services. These include the usual utilities and also education and health services, as well as negative externalities such as greenhouse gas emissions. Most such studies have concluded that there are significant financial and economic cost advantages of inner city redevelopment compared with fringe development.

Given this range of flow-on effects of transport policy and investment decisions, particularly in the context of urban/metropolitan areas, there would appear to be a compelling case that these effects should be assessed along with the ‘first round’ effects on travel times, vehicle operating costs and safety benefits that are the focus of conventional transport economic assessments using cost-benefit analysis methods.
4.6 Conclusions

4.6.1 Main findings

This chapter has focused on the spatial impacts of transport system changes, principally at a local/regional level.

Transport investment is often seen as an effective policy available to governments to boost the economies of less economically buoyant regions, through improving transport links both within the target region and to/from adjacent regions. However, such policies will not necessarily be successful, in particular because of the two-way road problem; they may result in additional private investments and employment opportunities flowing into the region, but may equally result in population and employment opportunities flowing out of the target region because of the improved access to other centres. Any policy to apply transport investments to support regional development would warrant very careful appraisal in the light of various key features of the specific situation (as outlined in the preceding text).

The empirical evidence about the effects of transport investments on regional development is surprisingly sparse and of variable quality. The (generally optimistic) forecasts of many modelling studies have not materialised in practice. The evidence indicates that most regional impacts involve transfer of activity from other regions, rather than net increases in aggregate activity.

However, at an urban/metropolitan level, there is strong evidence that enhancements in accessibility to or in particular areas can have major effects on the location and pattern of development (for example, the opening of the Auckland Harbour Bridge). In the longer term, accessibility changes can influence the form and density of the urban area, including the balance between the use of different transport modes (including walking and cycling for shorter trips and public transport for longer trips).

4.6.2 Specific questions

Is it possible to identify in advance those transport projects which will contribute to economic development prospects and those that won’t?

This is a difficult area of policy analysis. Not all transport investments will be equally effective in enhancing economic growth. Transport investment is a necessary, but on its own not sufficient, requirement to generate significant economic growth at either a national or regional level. Research evidence suggests various complementary conditions need to be met to accompany transport investments in order to enhance economic growth. Several researchers have specified these conditions under three categories: economic conditions, investment conditions and political and institutional conditions; and some researchers comment that the last of these categories (covering the broader policy environment in which the investment takes place) is the most important of the three.

What can we conclude about the effectiveness of transport investments in enhancing economic growth and development in particular regions?

This is an important question that often arises, particularly when considering major transport investments either within a less economically buoyant region or between that region and adjacent regions. Despite the importance of the question, the theoretical and empirical evidence on the topic is not as strong as would be desirable.
Although in some circumstances transport investment may be a necessary condition for enhancing economic growth, it is rarely on its own a sufficient condition. Other factors, including the broader policy environment, need to be present if the investment is going to be successful in addressing regional economic objectives.

The UK SACTRA report (1999) identified the ‘two-way road problem’ as a key issue in attempts to promote regional development by means of transport investment within the region and between it and other regions. This issue is concerned with under what conditions transport investment will benefit the target region and under what conditions there would be an outward flow of investment and jobs from that region. SACTRA suggested the following key aspects as being most relevant:

- scale economies (for example, where these dominate, lower transport costs through improved accessibility may encourage an increased concentration of firms in core regions, until the point that diseconomies set in)
- size of the local market
- local land and labour conditions
- the nature and scale of transport improvements
- the nature of backward and forward linkages in the local economy.

In relation to this last point (principally), the strength and nature of the local economic linkages, in both existing and future situations, may be examined through regional transport/economic models (for example, Computable General Equilibrium (CGE) models). However, such models have extensive analytical and data requirements and suffer from a number of practical and statistical difficulties, making their application both relatively costly and risky.
5. Government objectives and roles in the transport sector

5.1 Introduction

As discussed in the AERU review, the quality of investment decisions in physical and other capital depends on sound government, political, business and civil institutions. Figure 2.2 noted the role of institutions and of an overall institutional framework as part of the broader transport system.

As also shown in Figure 2.2, one key characteristic of transport is its split between infrastructure and operations. ‘Infrastructure’ refers to the ‘right of way’ on which vehicles operate, which may include ancillary facilities to ensure efficient and effective operations (for example, traffic signals, railway stations, port facilities). ‘Operations’ refers to the operation of vehicles and vessels, on or making use of the infrastructure.

In New Zealand, as in most other developed countries, transport is operated principally by the private sector — private cars, road trucks, shipping and the majority of bus and coach services. There are exceptions — rail services (operated by KiwiRail) and air services (Air New Zealand is partially government owned).

Transport infrastructure in New Zealand, as in most other developed countries, is largely provided by governments (central and local). There are multiple reasons for this, as outlined in this chapter.

The chapter is structured as follows:

► Section 5.2 – Sets out the New Zealand Government’s strategic framework, objectives, outcomes and priorities relating to the transport sector.
► Section 5.3 – Outlines government roles in the transport sector, both generally (in developed countries) and specifically in New Zealand.
► Section 5.4 – Focuses on government roles in the provision of transport sector infrastructure in the economic rationale for this role.
► Section 5.5 – Presents a summary of findings and conclusions from the chapter.

Within these sections, the chapter also addresses the following specific questions:

► What are the New Zealand Government’s objectives for the transport sector?
► What are the government’s roles in transport and their rationale for involvement?

5.2 New Zealand Government transport sector objectives

Figure 5.1 sets out the New Zealand Government’s strategic framework relating to the transport sector, covering:

► the overall purpose of Government involvement in the transport sector
► Government’s overall objective for the transport sector

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11 Saunders and Dalziel (2014) Economic development: A review of the key themes in the international literature (Page ix)
Government’s desired outcomes over the longer term
Government’s shorter-term priorities in the sector.

The overall structure of this framework is not very different from that adopted by government transport agencies in quite a number of other developed countries, but of course the frameworks in different countries have different emphases and priorities.

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**Overall Purpose**
To ensure our transport system helps New Zealand thrive

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**Objective**
To develop a transport system that maximises the economic and social benefits for New Zealand and minimise harm

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**Long-term Outcomes**
To create a transport system which is:
- Effective – moves people and freight where they need to go in a timely manner.
- Efficient – delivers the right infrastructure and services to the right level at the best cost.
- Resilient – meets future transport needs and endures shocks.
- Safe and responsible – reduces the harms from transport

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**Shorter-term Priorities**
- Investment in infrastructure
- Better quality regulation
- A safer transport system
- Opening markets


Figure 5.1: New Zealand government transport strategic outcomes framework
5.3 Government roles in the transport sector – general

In general, governments are involved in transport to:

- establish policy priorities on behalf of society
- address market failures
- organise funding and charging
- design and enforce regulations
- facilitate planning and coordination.

In New Zealand, central government’s roles in the transport system are performed in conjunction with local (including regional) government, the private sector, and individual citizens. Central government’s roles include:12

- setting the policy and regulatory framework for the transport system
- having ownership responsibility for transport crown entities (including KiwiRail)
- providing key infrastructure (including State highways, the rail network, and Airways New Zealand)13
- investing in transport infrastructure and services provided by others, including contributing to the costs of public transport services and local roads.

Local government is involved in the planning and development of the land transport system in partnership with central government. Local authorities have responsibility for regional and local transport planning. They own the local roading network, which provides access to the wider network from the properties of ratepayers. They also take primary responsibility for the planning and procurement of local/regional public transport services. Some local authorities also have an ownership interest in sea and air ports.

One of the New Zealand Government’s priorities over the short/medium term is to continue to build a more competitive and productive economy, and it regards the transport sector as being a major contributor to this, particularly through the provision of improved infrastructure (Ministry of Transport Statement of Intent 2014–2018).

So the transport system can be important in contributing to economic productivity and growth, while it also provides access and mobility for people to carry out their daily lives, whether or not their travel has any direct impacts on the economy. At one level, transport is simply one input into business operations and one element of household spending, so we all have an interest in the productivity of the transport industry.

But productivity and ‘value for money’, terms used frequently in government policy statements are broader concepts. They are concerned with the allocative and dynamic efficiency effects of transport policy and infrastructure decisions. Such decisions can have a significant role in influencing or

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12 Connecting New Zealand 2011
13 New Zealand’s air navigation service provider
responding to changing production patterns, for example, location of enterprises, sourcing of inputs, distribution of products, and where people live and work.

As discussed later, this proposition has implications for the choice of evaluation tools and the breadth of economic effects considered.

5.4 Government roles in the transport sector – provision of infrastructure

Transport infrastructure is a major component of the fixed capital of the transport system. With the main exception of traditional railway companies, transport firms do not own the fixed capital used in the production process. They acquire transport infrastructure services on a ‘pay as you go’ contribution basis, for example, in New Zealand through road user charges and fuel excise duty. The reason for this is that sharing fixed capital with others is normally more economical than acquiring the required pieces of infrastructure for one’s own exclusive use.

The reasons for State involvement in both providing and managing transport infrastructure derive from its economic characteristics, which may be summarised as follows.

► Roads have characteristics of a ‘public good’, in the sense that they provide the only access for the public to adjacent land and properties and so need to be available for all.

► Much transport infrastructure has ‘natural monopoly’ characteristics: its features of lumpiness and asset specificity mean that in many circumstances there will only be one provider of infrastructure on any one route (that is, a natural monopoly situation). In such circumstances, government could regulate the infrastructure provider, to avoid exploitation of monopoly power (in New Zealand, this regulation occurs for major airports). But in other circumstances, problems with regulation can lead to direct provision (or nationalisation) of the services.

► ‘Market failure’ considerations. Infrastructure consists essentially of large, lumpy investments characterised by a high degree of asset specificity. This makes decisions on the appropriate levels of investment difficult, since it is frequently necessary to choose between investments that are smaller or larger than the apparent optimal capacity to serve revealed demand. It may also lead, on occasions, to a failure to invest by the private sector when the investment requirements and risks are very large, but the infrastructure is seen as being in the long-term public interest. (One example here is the decision of the New Zealand Vogel government to invest in the early development of the railway network in New Zealand.)

► In addition to these market failure arguments, there is an ‘externality’ rationale for government involvement in infrastructure provision (such externalities may be both positive and negative). It is argued that infrastructure may lead to wider economic benefits than those captured by any charge that a provider can impose on direct users. This may justify the provision of infrastructure out of general taxation rather than through direct charging for use.

Transport infrastructure is the most visible aspect of government’s involvement in transport and one that is associated with ‘big ticket’ projects or programmes. Infrastructure decisions (by central and local government) play out and interact with a complex spectrum of legislation and regulation, some of which is transport-specific (for example, the Land Transport Management Act 2003), and some is of
wider application (for example, the Resource Management Act 1991).

5.5 Conclusions

This chapter has outlined government objectives and roles in the transport sector, both generally in developed countries and specifically in New Zealand. It has focused particularly on government roles in providing transport sector infrastructure and why this is generally a role for which governments take direct responsibility.

What are the New Zealand Government’s objectives for the transport sector?

Figure 5.1 sets out the New Zealand Government’s strategic outcome framework relating to the transport sector, covering (Ministry of Transport Statement of Intent, 2014–2018):

► overall Government purpose relating to the sector
► Government objectives for the sector
► desired long-term outcomes
► shorter-term priority areas.

What are the government’s roles in transport and their rationale for involvement?

In New Zealand, central government’s roles in the transport system are performed in conjunction with local (including regional) government, the private sector, and transport users. Central government’s roles include:

► setting the policy and regulatory framework for the transport system
► having ownership responsibility for transport crown entities
► providing key infrastructure (including State highways and the rail network)
► contributing to the costs of transport infrastructure and services provided by others, including public transport services and local roads.

In some countries, governments are themselves owners and operators of transport services, for example through direct provision of road and rail freight services and bus/coach and rail passenger services. In New Zealand, central government’s role as an operator is essentially limited to rail services (freight and long-distance passengers — which were previously privatised), although it is also a majority owner of Air New Zealand.

As in most other developed countries, the road network in New Zealand is owned by government — in New Zealand with the main routes (State highways) being owned by central government, and other roads by local governments. Given the economic features of road provision (including public good and natural monopoly characteristics), there is a strong economic rationale supporting public ownership of the road network.
6. Assessing the economic contribution of transport – approaches to project appraisal

6.1 Introduction
This chapter compares, based on international literature and practice, approaches to transport economic appraisal that focus on economic welfare appraisal (such as social cost-benefit analysis) with approaches focusing on levels and patterns of economic activity (such as contribution to GDP). It then comments on current New Zealand transport investment appraisal practices in the light of these alternative approaches.

The chapter is structured as follows:

▲ Section 6.2 – Sets out the alternative perspectives, and their interrelationships, that can be adopted to measure the economic contribution of the transport system.
▲ Section 6.3 – Describes the economic welfare perspective (as used in cost-benefit analysis, and including wider economic impacts) which measures the aggregate socio-economic effects to society of transport investments.
▲ Section 6.4 – Describes the macro-economic perspective, which focuses on assessing GDP and other measures of the levels and distribution of economic activity.
▲ Section 6.5 – Presents a summary of findings and conclusions from the chapter.

6.2 Alternative assessment perspectives
As discussed earlier, the economic contribution of transport and transport policy can be measured or observed from various perspectives. These include:

▲ Micro-economic (for example, enterprise or household) productivity effects
▲ Aggregate effects on economic welfare (that is, the sum of consumer and producer surplus, which is the focus of cost-benefit analysis), as applied to policies or projects.
▲ Macro-economic (for example, contributions to GDP, investment or employment), and impacts on the spatial patterns of economic activity.

This chapter focuses on the relationship between the second and third of these. The key question here is in what circumstances welfare gains from major infrastructure projects are likely to be a good indicator of economic growth effects? Or, put another way, under what conditions are there likely to be strong correlations between the economic efficiency effects and economic growth effects of such projects?

Transport socio-economic appraisal (cost-benefit analysis ) estimates the present value of forecast economic benefits and costs of projects, and the net effects on economic welfare for society as a whole. Economic benefits are estimated using the concept of ‘consumer surplus.’ The main idea is that consumers, for example of roading services, individually have a maximum ‘willingness-to-pay’ (WTP) greater than the cost to them of using the service. So if the cost of travel is reduced, for example by a roading improvement, this margin will increase, as will consumer surplus, which is the product of this dollar margin (WTP less actual cost per unit of travel) and the quantity of the service.
consumed (that is, the number of vehicles or persons using the road).

In cost-benefit analysis and similar appraisals, the main benefits from roading projects are in the form of costs avoided, that is, travel time savings, vehicle operating cost savings and reductions in accident costs. These will be directly captured in welfare measures, but the question here is how do these projects affect economic growth and productivity? There is much more to economic growth than the travel time savings, vehicle operating cost savings and safety benefits estimated in cost-benefit analysis.

The Venn diagram\(^\text{14}\) in Figure 6.1 illustrates the set of impacts (benefits) incorporated in socio-economic appraisal those incorporated in the assessment of GDP impacts, and the overlap between these two applications. It is evident that there is considerable overlap between the impact categories covered in the two types of assessment. However, this says nothing about the relative size of each of these effects in the different assessments. For example, for some roading projects, safety improvements can account for 40 to 50 percent of estimated project benefits. The project might, as a consequence, achieve a high benefit: cost ratio (BCR) but this tells us little about its contribution to economic growth. Therefore, an important question to be addressed is whether a road or rail project that scores highly in terms of its BCR would necessarily rank highly from an economic growth/productivity perspective.

\(^{14}\) Refer Department for Transport discussion paper (2005) *Transport, wider economic benefits and impacts.*
We note here that the ‘business case’ approach being adopted for assessing transport investment projects, in both New Zealand and the UK, comprises five cases:

- the **strategic case** for change, that relates to wider public policy objectives
- the **economic case** — value for money
- the **commercial case** — commercial viability
- the **financial case** — financial affordability
- the **management case** — achievability.

The socio-economic welfare appraisal (cost-benefit analysis) would provide the information required for the **economic** case. The scheme impacts on GDP and economic development, whether at national, regional or local levels, would usually be considered as part of the **strategic case** (although arguably they might be considered as part of the economic case).
6.3 The economic welfare perspective

Socio-economic appraisal (generally using cost-benefit analysis) involves estimation of the aggregate economic effects to society (that is, consumer plus producer surplus) of a project or policy. It is long established within the transport sector as the primary means of assessing the socio-economic merits of investment proposals.

Until recently, transport sector cost-benefit analysis had been restricted to a relatively limited set of impacts — principally time savings (for business and leisure travellers), operating cost savings and safety (accident) cost impacts. More recently, as outlined below, the scope of cost-benefit analysis in New Zealand (taking the lead from UK research and practice innovations) has been extended to cover wider economic impacts (WEIs). Figure 6.2 illustrates that some these WEI are now assessed in New Zealand evaluations (in appropriate cases) along with conventional benefits.

![Diagram of Conventional benefits and Wider economic benefits]


**Figure 6.2: Benefit categories considered in cost-benefit appraisals**

Regarding these wider impacts (outside the transport sector), Economic Evaluation Manual (EEM) states as follows (EEM section A10.2.):

*In addition to, or in some cases as a consequence of direct impacts, there can be indirect impacts on the economy. These may cause a redistribution or reallocation of resources or may cause the entry or exit of firms. These are wider economic impacts and can include:*

- **Economies of scale from improved transport that can encourage agglomeration specialisation of economic activity.**
- **Mitigating existing market failures by improving accessibility and therefore competition between spatial markets.**
- **Increased output in imperfectly competitive markets by diminishing persistent externalities.**
- **Technology and knowledge transfer by connecting people and places and increasing the interaction between economic actors.**
It then comments that:

*The following wider economic benefits are applicable in the New Zealand context:*

- Agglomeration where firms and workers cluster for some activities that are more efficient when spatially concentrated.
- Imperfect competition where a transport improvement causes output to increase in sectors where there are price cost margins.
- Increased labour supply where a reduction in commuting costs removes a barrier for new workers accessing areas of employment.

Further discussion of WEIs is provided in Appendix B. This describes in more detail each of the WEIs that are now included in cost-benefit analysis in New Zealand and UK (and some other countries).

A UK Department for Transport discussion paper (2005) focused on the assessment of wider economic impacts and the impacts of transport investment on GDP. In relation to its examination of WEIs and their significance in the cost-benefit analysis appraisal, it concluded that:

(a) Wider economic benefits are not always trivially small, so failing to incorporate them risks distorting decisions between transport schemes or between programmes across government;

(b) Transport appraisal already captures most economic benefits and costs, including much of the impact that transport has on welfare through GDP. It would be surprising if the wider economic benefits addressed in this paper (either individually or in combination) were even nearly as large as the impact on time savings and reliability.

(c) The wider economic benefits that are missing from conventional appraisal reflect the main market imperfections: agglomeration externalities, imperfect competition (split in two for the purpose of this paper) and the economic benefits of increased employment and productivity.

(d) It is possible, as SACTRA has observed, for a scheme to have negative wider economic benefits (i.e. wider costs). However, positive wider economic benefits are generally more likely: imperfect competition and the presence of taxes both imply positive wider economic benefits for all schemes that facilitate faster or more reliable journeys (on any mode), while agglomeration effects could go either way.

The paper also provides an example, from a UK scheme (London’s Crossrail project), of estimated welfare benefits, divided between ‘conventional’ benefits (principally time savings) and WEIs. This is given in Table 6.1. While this example is not typical, it shows that WEIs accounted for an addition of some 56 percent to the conventional welfare benefits. This illustrates that WEIs can comprise a very significant proportion of total welfare benefits, although noting the Crossrail project is exceptional and WEIs are unlikely to account for such a large proportion of benefits for most projects.
Table 6.1: Summary of Crossrail’s welfare and GDP impacts (net present value, discounted over 60 years)

<table>
<thead>
<tr>
<th>Benefits</th>
<th>Welfare (£M)</th>
<th>GDP (£M)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Business time savings (also equal to GP6)</td>
<td>4,847</td>
<td>4,847</td>
</tr>
<tr>
<td>Commuting time savings</td>
<td>4,152</td>
<td></td>
</tr>
<tr>
<td>Leisure time savings</td>
<td>3,833</td>
<td></td>
</tr>
<tr>
<td><strong>Total transport user benefits – conventional appraisal</strong></td>
<td><strong>12,832</strong></td>
<td></td>
</tr>
<tr>
<td>Increase in labour force participation (GP1)</td>
<td></td>
<td>782</td>
</tr>
<tr>
<td>People working longer (GP2)</td>
<td></td>
<td>0</td>
</tr>
<tr>
<td>Move to more productive jobs (GP3)</td>
<td></td>
<td>10,772</td>
</tr>
<tr>
<td>Agglomeration benefits (WB1, GP4)</td>
<td>3,094</td>
<td>3,094</td>
</tr>
<tr>
<td>Increased competition (WB2, part of GP5)</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Imperfect competition (WB2, part of GP5)</td>
<td>485</td>
<td>485</td>
</tr>
<tr>
<td>Exchequer consequences of increased GDP (WB4, which depends on GP1, GP2 &amp; GP3)</td>
<td>3,580</td>
<td></td>
</tr>
<tr>
<td><strong>Additional to conventional appraisal</strong></td>
<td>7,159</td>
<td></td>
</tr>
<tr>
<td><strong>Total (excluding financing, social and environmental costs and benefits)</strong></td>
<td><strong>19,991</strong></td>
<td><strong>20,069</strong></td>
</tr>
</tbody>
</table>

Source: Department for Transport (2005)

6.4 The GDP perspective

It is evident from Figure 6.1 (Venn diagram) that there is considerable overlap between the impacts incorporated in the economic welfare assessment and those included in an assessment of GDP impacts, but there are also considerable differences. The principal differences are outlined below.

- The GDP assessment includes business time (and reliability) savings, but excludes time savings for other trip purposes (including commuting). It also excludes social and environmental impacts.
- The GDP assessment includes the WEIs, as discussed in the preceding section.
- It also includes labour market effects which do not contribute to welfare, which comprise three sub-components:
  - more people choosing to work, or fewer people choosing to stop work (because one of the costs of working – commuting costs – has fallen) (item GP1 in table 9.1)

15 There are effects in the labour market that may mean further effects of transport on GDP if transport directly or indirectly causes an increase in labour supply. In this case, GDP rises because time savings (which are captured as welfare benefits in appraisal) have an impact on the labour supply decision of a few individuals. But for some of these individuals, the welfare impact may be smaller than the GDP effect (since, for instance, joining the labour market means the worker needs to give up valuable spare time). Refer UK DfT (2005) Transport Wider Economic Benefits and Impacts on GDP.
some people choosing to work longer hours (because they spend less time commuting) (item GP2)
relocation of jobs to more productive locations (because better transport makes the area more attractive to employers and workers) (item GP3).

For each individual whose working habits are affected and for each job that is relocated, the associated GDP gains are higher (often considerably higher) than the net welfare gains, because of the associated welfare loss from the loss of time and extra cost and hassle of longer journeys. However, only a minority of individuals will turn any change in commuting time or costs into a change of job or longer hours.

Figure 6.3 (shown earlier as Figure 3.1) shows the links between transport initiatives, direct welfare (conventional) benefits and wider impacts on the economy, as seen by Eddington (2006). Eddington described how transport impacts on the economy in terms of seven ‘micro-drivers’, as listed in Figure 6.3 and described in more detail in Section 3.4.1. In addition, Appendix A.3 provides a summary of international empirical studies on the impacts of public investment (in general, and transport sector-specific in some cases) on GDP growth. The general finding from such research studies is that, although the benefits of transport infrastructure investment on economic growth are generally recognised, a direct causal link and the strength of this link are difficult to establish (OECD, 2003).

Links between transport and economic performance

Source: adapted from Eddington, R. (2006), The Eddington Transport Study, Main Report, Volume 1, Figure 2.3.

Figure 6.3: Links between transport and economic performance

A number of studies, in New Zealand and elsewhere, have examined the link between the size of the transport task (particularly for freight transport) and GDP. Most such studies have found a strong ‘coupling’ between these two factors. In New Zealand and some other countries, the more recent evidence has indicated some degree of ‘decoupling’ between these factors. The National Freight Demand Study (Ministry of Transport 2014, p.241) noted that “... there appears to have been a
decoupling of freight growth and GDP growth. That is, the increase in freight demand both in terms of tonne-kms and tonnes has been lower than would be expected given the historical relationship between freight and GDP. This suggests that there has been something of a shift in the relationships governing freight demand, possibly reflecting structural changes in the economy with a shift to less freight intensive service type activities.”

Table 6.1 includes a comparison of the GDP impacts and the economic welfare impacts for the London Crossrail project. Notable features for this project include:

► The total impact (benefits) in both cases is very similar in magnitude (comparing economic ‘soft’ pounds in the welfare assessment with financial ‘hard’ pounds in the GDP assessment).
► The GDP assessment excludes in particular commuter and leisure time savings, which accounted for over 60 percent of the conventional welfare benefits and 40 percent of the total welfare benefits.
► However, it includes the ‘move to more productive jobs’ as a major GDP benefit, accounting for over half the total GDP impacts.

As noted earlier, the Crossrail project should not be regarded as a typical transport investment project: further evidence would be needed from a wider range of projects in order to draw any general conclusions about relationships between total economic welfare impacts and total GDP impacts.

6.5 Conclusions

This chapter has outlined how the economic contribution of the ‘transport system’ and specific transport projects may be assessed from several perspectives, including particularly (i) impacts on socio-economic welfare (the sum of consumer surplus, producer surplus and any ‘wider economic benefits’), as applied using cost-benefit analysis methods; and (ii) impacts on GDP or similar measures of economic activity. It shows that the two perspectives involve significantly different analysis inputs, although there is also considerable overlap between the factors included in each perspective. While cost-benefit analysis is a tool most commonly used for the economic evaluation of transport projects, cost-benefit outputs cannot be taken as an adequate proxy for the project’s effects on the ‘real’ economy.
7. References


Drejer, I. (2003). *Input-output based measures of interindustry linkages revisited*. Retrieved from Department of Business Studies, Aalborg University, Denmark website:


Appendix A: Influence of transport system investments on economic growth – summary findings from key literature sources


Lakshmanan’s perspective on the relationship between transport and its impacts on the economy (productivity and GDP growth) is summarised in Figure A.1.

Source: Lakshmanan 2010

Figure A.1: Transport infrastructure and economic growth
Lakshmanan (2010) comments that,

... the lower costs and increased accessibility due to transport improvements modify the marginal costs of transport producers, the households' mobility and demand for goods and services. Such changes ripple through the market mechanisms endogenizing employment, output, and income in the short run. Over time dynamic development effects derive from the mechanisms set in motion when transport service improvements activate a variety of interconnected economy-wide processes and yield a range of sectoral, spatial, and regional effects, that augment overall productivity and economic growth....

Lakshmanan identifies several channels through which transport investment enhances economic growth and productivity.

(a) Gains from trade: Due to reduction in travel time and costs, firms gain easy and quicker access to markets. Their accessibility expands to regional, inter-regional and international markets.

(b) Technology diffusion: Upsurge in inter-industry and exchange of intermediate goods creates opportunities for adopting new technical knowledge associated with imports.

(c) Gains from agglomerations: Interactions between industries in a location become more efficient due to an increase in effective density, which in turn promotes the concentration of other related and spin off industries in the same location.


A focus of this study was to determine to what extent the ‘conventional’ benefits from transport infrastructure investments (principally travel time savings) translated into economic development benefits, either at a national or regional/local level.

Their basic conclusion was:

In developed countries where there is already a well-connected transportation infrastructure network of a high quality, further investment in that infrastructure will not on its own result in economic growth. Transport infrastructure investment acts as a complement to other more important underlying conditions, which must also be met if further economic development is to take place. (p. 318).

In other words, in a highly-developed dynamic economy, transport infrastructure investment will support economic growth when the underlying conditions are present, but it is not mandatory to achieve growth.
Three sets of ‘necessary conditions’ to facilitate economic development were identified:

- **Economic conditions:** such as the presence of positive economic externalities (that is, labour market, network or agglomeration economies), the availability of a good quality, skilled labour force, the presence of inefficiencies in spatial structure, and a generally buoyant local economy.

- **Transport investment conditions:** the transport mode being invested in, availability of investment funds, network effects (for example, is it a new link in an existing network, a new link connecting two ‘disjointed’ networks or expansion of a link in an existing network?), scale of investment, timing, its location and efficiency in implementation.

- **Political and institutional conditions:** related to the broader policy environment (the ‘non-economic’ factors) in which the investment takes place — for example, level of investment (local, regional, national), presence of complementary policies, and the organisational and managerial framework that the investment takes place in.

Individually, these conditions may have very little or no impact on economic development. Banister and Berechman (2000) maintained that “it is only when all three necessary sets of conditions are present and operating together that economic growth will ensue” (p. 320). They posited that the most important condition in encouraging economic growth as a result of transport infrastructure investment is the policy-making environment.

Banister and Berechman (2000) observed that transportation infrastructure investments are **location related**. This means that their potential impacts occur at the level of the local economy. Thus, they concluded that the identification and measurement of any economic growth resulting from such investment must occur at the local level. As analysis becomes more ‘aggregate’, many of the effects will be lost.

Banister and Berechman (2000) also noted that the presence of good transport infrastructure may raise the image and perceptions of a region, thereby attracting additional private investment.

### A.3 Eddington Study (2006)

#### A.3.1 Mechanisms by which transport supports the economy

Transport has played a critical role in economic development but the historical and macro-economic evidence can only take us so far. To focus transport policy on where it will make a real difference it is crucial to understand: what users value from the transport system; the mechanisms by which transport impacts on the economy; where transport may be the answer to economic challenges; and what the future implications are for the UK given its role in the world economy.

Good measurement of transport’s effects on the economy is of fundamental importance, and UK experts are at the forefront of this agenda. I am extremely grateful to the members of the

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small group of expert academics and government officials who advised my team and me on these matters. This study has sought to build on their expertise, and that of many others in the field.

The different mechanisms that underpin the relationship between transport and growth have been discussed at length in many previous studies and are the subject of a great deal of academic research. This study has sought to develop an understanding of those mechanisms which impact on GDP, in a way that can explicitly guide policy development and option generation to focus on the characteristics of the transport system that matter most to productivity and competitiveness.

The evidence is very clear that users want several things from the transport system, placing different weights on their relative importance. The key characteristics which are valued are: journey time, journey time reliability, cost, network coverage, comfort, safety and security (refer Figure 2.3 below).

When users experience an improvement or worsening of these characteristics, they feed through to impact on the economy through a variety of mechanisms – increasing business efficiency, investment and innovation, improving the functioning of agglomerations and labour markets, increasing competition, increasing trade and attracting globally mobile resources. These drivers are summarised in Figure 2 (and detailed in Volume 1.2).

A.3.2 Relationship between transport investment and economic performance

Whilst history demonstrates the importance of transport to productivity growth in the economy, the exact nature and scale of the relationship is much debated. Figure 1.5 sets out some of the recent literature in this area.

David Aschauer sparked the debate on the relationship between investment in public sector infrastructure and the performance of the economy in 1989. He found that for the United States economy a 1 per cent increase in the stock of public sector capital could boost GDP by 0.38 to 0.56 per cent annually. Subsequent studies suggest a much weaker link between infrastructure and growth. Although there is considerable variance in the empirical evidence, the studies are broadly consistent with the conclusion that a 1 per cent increase in public capital stock could result in a one-off, sustained increase in GDP of 0.2 per cent for a developed economy. The varying returns offered from these studies indicate the importance of targeting investment in the right places.

Although many of these studies are informative and shed some light on the relationship between transport and the performance of the economy, it would be misleading for transport policy to be developed on the basis of these expected returns to GDP.

In particular, there remains some ambiguity over the direction of causality in the relationship between transport investment and the performance of the economy. What comes first? Do

countries choose to spend more on transport as they grow richer? Or does an increase in GDP come after transport investment, i.e. transport investment generates economic success? Our analysis of the literature and engagement with expert academics in the field suggests that, in practice, it is likely to be a combination of the two.

Such studies also omit the wider economic, social and environmental impacts not accounted for by the narrow definition of GDP. On balance, therefore, the above analyses may be understating the true magnitude of the relationship between transport investment and the performance of the economy. The Study’s view is that the link between transport and productivity is clear and is best demonstrated through the micro-economic approach (which the next chapter goes on to explore).

A.3.3 Conclusions and comments on the relationship between transport investment and economic growth

Whilst there are circumstances where transport is very important in enabling economic growth, there are a number of reasons why it is wrong to think that transport is the key ingredient in all circumstances:

► there are times and places where countries have grown rapidly without significant transport improvements. For instance, Ireland’s recent growth was achieved predominantly on the back of an attractive investment environment and investment in labour force skills. Only now, as greatly increased demand has started to outstrip supply, has transport become a factor in limiting that growth; not all transport projects will deliver growth benefits. In particular, where adequate transport infrastructure is already in place, additional investment is unlikely to deliver further economic benefits;

► “build it and they will come” is a dangerous approach to transport projects which attempt to regenerate areas and regions. Often the result is a two-way process in which local businesses actually lose out, as more productive and competitive firms from other regions can access the area and compete for previously protected markets. Only in some circumstances will transport have a role to play in regenerating an economy. In many potential regeneration cases there will not be signs (e.g. congestion) that inadequate transport capacity is constraining the growth potential of a particular area. It may well be other structural problems, such as skills shortages. For example, areas of London which benefit from very good transport connectivity, can also show very high signs of deprivation. Transport can only support growth if other vital conditions are right, and sometimes policies such as skills or fiscal incentives may be more appropriate in driving economic performance; and

► where the environmental impact of transport growth is not factored into decision-making, the positive impact of a transport project is likely to be overstated, since the negative

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long-term impact of transport emissions is not balanced against the short-term benefits. Correspondingly, the social benefits provided by transport, should also be factored into decision-making.

This important truth – that there are both good and bad transport policies and investments – suggests that being as smart as possible about investment and pricing decisions could yield considerable benefits for the UK economy. Such an approach needs to be alive to future economic and social dynamics and how they may impact on the country’s changing transport needs.


A.4.1 Conclusions

Transportation is a necessary requirement for economic growth in the early stages of a country’s economic development. Hence, transport infrastructure investment and other transport-related improvements (particularly to do with improved information and travel demand management) can and do have impacts on economic productivity for particular people or industry sectors. However, in a developed economy, such productivity improvements may or may not lead to net economic growth, either at the regional or national level.

The fundamental conclusion of this brief reconnaissance of the literature is perhaps best summarised by Banister and Berechman (2000);

“In developed countries where there is already a well-connected transportation infrastructure network of a high quality, further investment in that infrastructure will not on its own result in economic growth. Transport infrastructure investment acts as a complement to other more important underlying conditions, which must also be met if further economic development is to take place.” (p. 318).

This statement is regarded as true whether the national economy or a regional/local economy is being considered. One ECMT (2002) paper suggested that, when opportunity costs are fully analysed, other types of public investment expenditure, particularly to develop human capital, will have greater rates of return.

The reports reviewed offered various suggestions as to the nature of the ‘underlying’ conditions that complement transport infrastructure investment and contribute to economic growth, including:

19 Refer O’Fallon (2004, pages 13 to 15)
Economic conditions:

► The presence of positive economic externalities (eg labour market, network or agglomeration economies).
► The potential for economies of scale.
► The potential for specialisation of markets to occur.
► The availability of a good quality, skilled labour force.
► The availability of resources that “represent entrepreneurial effort that would not have occurred without the infrastructure being in place” (NCHRP, 1997:8).
► The presence of inefficiencies in spatial structure.
► A generally buoyant economy.

Investment conditions:

► The transport mode being invested in.
► The availability of investment funds.
► Network effects (eg is it a new link in an existing network, a new link connecting two ‘disjointed’ networks or expansion of a link in an existing network?)
► Scale, timing and location of investment.
► Efficiency in implementation.

Political and institutional conditions: related to the broader policy environment (the ‘non-economic’ factors) in which the investment takes place:

► Sources and method of finance.
► Presence of complementary or facilitative policies/action (eg training programmes, structure of tax system, facilitating the entry of competitive and/or innovative firms, etc).
► The organisational and managerial framework of the infrastructure facilities.
► The ‘political involvement of the political organs’ (Banister and Berechman, 2000: 333).

Banister and Berechman (2000) argued that all three conditions (economic, investment, political and institutional) must be present for economic growth to occur, but that the most important condition is the policy environment.

Transportation infrastructure investments are ‘location-related’, that is their potential impacts occur primarily at the ‘local economy’ level. Thus, the identification and measurement of any economic growth should be undertaken at this level.

It is far from clear that any economic growth associated with transport investment will accrue to the actual area where the investment occurs. The improved transport connection may either attract development or labour to the region, or it may encourage it to relocate elsewhere due to reduced transport costs, better access to markets, economies of scale or agglomeration economies, etc. Thus, investing in transport infrastructure with a view to regenerating or assisting development in a specific region – unless coupled with other
resources (such as private capital), desirable economic or policy conditions – may not achieve economic growth in that location.

A.4.2 Implications for New Zealand

The findings of this paper suggest that:

1. Transport investment on its own cannot be relied on to contribute to regional development, but will be complementary to other economic, political and investment conditions necessary for that development – thus, regional development needs to be addressed in an integrated manner (as is by the Ministry for Economic Development).

2. There is a significant risk that the benefits of improving transport infrastructure in a smaller, lesser developed region – unless it has unique resources – will not accrue to that region, but instead will be centralised to larger, more diverse regions. There is a 2-way flow of benefits. This risk should be recognised in regional development planning.

There has been a significant focus on the development and congestion of the transport network in the Auckland region by the government and large business interests and, in December 2003, the government announced a significant package designed to “get Auckland moving”. Addressing congestion undoubtedly contributes to the sustainability of the transport network and the environment and will generate economic benefits. The significant investment and improvements in the transport infrastructure are also likely to improve economic productivity in the Auckland region – particularly given the potential for agglomeration and network economies, economies of scale and the well-developed links to the international transport network. However, it is probable, as indicated by the Allen Consulting Group (2004) report, that much of this growth will occur as a result of the ‘displacement’ of resources (labour and industry) from other regions to Auckland. Any national economic growth will be quite marginal and will happen over a long time period as the transport network is completed.

In general, the New Zealand economy and transport network (including maritime and airports) is already well developed, meaning that additions and improvements to the transport network will only contribute to economic growth at the margin, and then only when the economic, investment and institutional/policy conditions identified above have been met. This does not mean that the transport network improvements not worth embarking on, but simply that expectations about the potential impact need to be tempered somewhat. After all, as Gramlich (1994) observed:

“If public investment really were as profitable as claimed (by some analysts), would not private investors be clamouring to have the public impose taxes or float bonds to build roads, highways and sewers to generate these high end benefits?” (p. 1187).

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20 Refer O’Fallon (2004, pages 15 to 16.
21 Now Ministry of Business, Innovation and Employment

This report involved an extensive international literature review, covering the role of transport investment in promoting economic development in general, and its economic and distributional impacts in particular.

Relevant questions posed in the project and the responses/conclusions drawn on these questions were as follows:

Are there particular features of transport investment (in general) that make it especially effective (such effects maybe not fully reflected in cost-benefit analysis or alternative methods of assessment) in promoting/increasing national (and regional) economic growth?

Responses:

► Evidence for a ‘special role’ in respect of transport infrastructure investment’s economic growth effects (as opposed to effects generated by other public spending, such as on education or health) is limited. The high rates of return to transport investment claimed by some past studies are likely the result of statistical correlation or other model specification issues.

► Likewise, there is nothing ‘special’ about investment in transport infrastructure from a regional perspective. While there is some evidence regarding the responsiveness of growth to investment in transport infrastructure, this is no less true than other forms of public spending. It is unlikely that investment in transport infrastructure will have dramatic effects on regional economies.

► In general, development of transport infrastructure is a necessary but not sufficient condition for national and regional economic development and growth.

► The incremental economic gains of further investment in transport infrastructure in developed economies are likely to be small. Arguably, there is a spectrum within which some developed economies may experience greater gains more than others, but solid evidence to this effect is lacking.

► There is no strong evidence that cost-benefit analysis omits significant flow-on effects to the broader economy. The argument that previous work, citing high returns to transport investment, has somehow revealed cost-benefit analysis’ ‘omitted benefits’ is therefore unsustainable.

Is the upgrading of transport links within or to/from a particular (‘disadvantaged’) region likely to be an effective means of enhancing the economic development of that region, and in what circumstances?

Response:

► Upgrading of transport links within or to/from a given ‘disadvantaged’ region, in and of itself is insufficient for enhancing regional economic development. As is the case for
national development, transport is, in general, a necessary but not sufficient condition for regional development. There is a clear need for other supporting programs and infrastructure to be in place.

Further, neither economic theory nor experience offers no conclusive guidance regarding the distributional impact of transport investment on specific regional economies. Issues such as the ‘two-way road problem’, the need for supporting measures, well developed transport networks and economic displacement effects cloud the ultimate impacts of transport investment on economic development within a specified ‘target region’.

Analysts such as O’Fallon (2004) have stressed that regional growth may simply result in the displacement of economic activity from one region to another. Though she may overstate her case, displacement effects are a real issue.


Evidence on economic development and land use impacts

This paper examined the evidence available from international case studies (mostly from the UK and Europe) on the impacts of new road schemes on land use and economic development. Its main focus was on empirical (before/after) evidence relating to situations where new roads have been built, but some of the evidence examined was from theoretical/modelling studies rather than direct observations. The evidence examined covers the impacts of new road schemes on land values, development pressures and actual development (including impacts on employment). Market research into the importance of transport factors in commercial/industrial location decisions was also noted.

The following are the main findings drawn from this evidence and other sources:

► New or improved roads that enhance accessibility of particular areas result in increased land values in these areas, whether the land is zoned for commercial, residential or other developments.

► The types of new developments which are particularly attracted to highly-accessible locations associated with new roads in peripheral urban areas (e.g. land adjacent to motorway junctions) tend to be:

  ► Distribution/warehousing activities, serving national and regional markets
  ► Hypermarket and superstore developments, that depend on large catchment areas
  ► High-technology growth industries
  ► Offices requiring good access for employees and visitors, but not requiring central area locations.

► The evidence on factors influencing the location of commercial/industrial businesses is somewhat conflicting on the importance of transport factors. However there is evidence that good road access is a major factor influencing such decisions.
► Improving access to under-developed areas with previous poor access does not necessarily increase the development of such areas relative to other areas. There may be employment gains in some sectors, losses in others (for example, the distribution sector). This is the ‘two-way road’ issue.

► Some theoretical studies suggest that enhanced access may result in substantial increases in employment in areas with poor access previously, eg the UK Severn Bridge/M4 study suggested an increase in employment in South Wales of some 4 percent. However such theoretical study results are often not substantiated by the empirical evidence—which tends to indicate much smaller impacts.

► It is generally considered that improvements in accessibility to under-developed areas will not be a sufficient condition, and may not be a necessary condition, to stimulate economic growth in such areas. It is argued (Breheny 1995) that road investment will only make a significant difference where it is the only missing feature of a strong economy. New road infrastructure is likely to be more effective in stimulating development, in the context of a strong economy, where it removes a constraint to the spread of development pressures in the area/region concerned.

► There is very limited evidence, from either theoretical or empirical studies, on the net effects (as distinct from the gross effects in the area directly affected) on the development/employment effects of enhanced access. In general, it is likely that most of the gross effects represent transfers from other areas.

► Major new road schemes would generally ‘induce’ different patterns of land use development than would occur in the absence of the scheme. In particular, they may lead to rezoning of parcels of land in the vicinity of the scheme (e.g. motorway intersections), which will be attractive to particular types of commercial development (as noted above). Such differential land use impacts should properly be taken into account when assessing the traffic, economic and environmental impacts of major road schemes.


A.7.1 Introduction

In 1996, SACTRA was asked by the UK Government to consider the effects on the performance of the economy which might be caused by transport projects and policies, including new infrastructure. SACTRA produced its final report in August 1999, and the Government published its formal response in 2000.
The SACTRA report addressed four main questions:

► Do transport improvements lead to increased, or more efficient, economic activity?
► Is it possible to ‘decouple’ growth in traffic levels from growth in the economy, in order to obtain the positive benefits of greater wealth, while reducing some of the negative effects of congestion and environmental impacts?
► Are economic impacts fully captured in the procedures for estimating benefits and costs currently used by the Department of the Environment, Transport and the Regions?
► What recommendations follow for the Department’s procedures and practice for transport appraisal?

The SACTRA report is an important source document for the project, as it drew together much of the theory and empirical evidence on these questions (but noting this has since been updated in some respects).

The following summary is taken directly from the UK Government response to the SACTRA report.

A.7.2 SACTRA’s main findings

Do transport improvements lead to increased economic activity?

There are strong theoretical expectations that all or a part of a transport cost reduction will lead to economic impacts outside the transport sector but the empirical evidence of the scale and significance of such impacts is weak and disputed. Conclusions about the effects of transport on the economy are strongly dependent on local circumstances. (Further discussion, supporting this answer, is given in section A7.3 below.)

Is it possible to ‘decouple’ growth in traffic levels from growth in the economy, in order to obtain the positive benefits of greater wealth while reducing some of the negative effects of congestion and environmental impacts?

This question can be taken in three parts: (i) whether the income elasticity of demand for transport services declines as transport use increased; (ii) the case for policy instruments influencing the volume of traffic; and (iii) if policy can influence traffic, whether or not this will have a favourable or unfavourable economic effect. The SACTRA report focused on parts (ii) and (iii).

Income growth has a strong influence on traffic growth, as do other factors such as price, speed and the quality of transport. For a particular level of economic activity, it is feasible, in principle, and quite simple in practice to develop policies to change the volume of traffic.

There are conditions where measures to control traffic will raise transport prices but still have a favourable local or national impact. There is empirical evidence on the sensitivity of traffic levels to cost changes but not on the effects on economic performance at a national level. The optimum level of traffic reduction (or increase) to aim for will vary according to the circumstances and should therefore be the subject of cost benefit appraisal.
Are economic impacts fully captured in the procedures for estimating benefits and costs currently used by the Department of the Environment, Transport and the Regions?

The underlying assumption in the appraisal of most transport schemes is that direct costs and benefits to transport users (primarily due to time savings, operating costs and accident reduction) and to non-users (environmental and other factors) will give a complete estimate of the value of a transport policy measure such as a new infrastructure or a traffic reduction measure.

There are some circumstances where the measurement of costs and benefits may be improved or require a different approach, including:

► **Incomplete valuations in the appraisal methods** (notably, freight and business travel, the value of time and reliability); and

► **Imperfections in the economy** (price distortions from competitive levels and external costs such as congestion and environmental damage).

There may also be a need to measure the spatial distribution of the value of any transport policy measure. The spatial effects of a transport improvement may not benefit locations at both ends of the route, and the ‘winners’ and losers; should be considered separately.

**What recommendations follow for the Department’s procedures and practice for transport appraisal?**

These are as follows:

► **Early in the process of appraisal of all important transport projects and policy initiatives**, a new formal procedure is required to identify the causes of market failure and consider the rationale for intervention.

► **An economic impact assessment is required** (the detail depending on an initial consideration) to include both additional effects due to any differences of prices from marginal social costs and incidence effects (spatial, sectorial and special) on economic activity.

► **Conventional social cost benefit procedures** should be improved to include the short, medium and long term effects of projects and policy intervention on vehicle ownership, frequency and structure of travel, and land use, for passenger and freight travel.

► **There should be a standard ‘economic impact report’** to bring these elements together.

**A.7.3 Impacts of transport improvements on economic activity (further discussion of Q1)**

Theoretical considerations suggest that the main mechanism by which changes in transport could have an effect on the economy is by a change in the costs of movement. We therefore defined a transport improvement as any intervention – whether by infrastructure investment,
more efficient transport management, or otherwise – which successfully produces sustained reductions in transport costs, or equivalent improvement in service delivered.

These cost reductions accrue to different categories of traffic, some clearly contributing more directly to economic activity than others, which in some cases will be reflected in their higher valuation of savings in travel time. However, we have not found it possible or helpful to define an absolute distinction between ‘productive’ and ‘unproductive’ classes of vehicle or traveller. So while focusing mainly on the traded transactions measured in GDP, we must also make allowance for some important activities, producing economic welfare, which take place outside the market context.

Given these definitions of ‘improvement’ and ‘the economy’, theory suggests that there are a number of important mechanisms by which such transport improvements could, in principle, improve economic performance. These include:

► reorganisation or rationalisation of production, distribution and land use;
► effects on labour market catchment areas and hence on labour costs;
► increases in output resulting from lower costs of production;
► stimulation of inward investment;
► unlocking ‘inaccessible sites for development; and
► triggering growth which in turn stimulates further growth.

Thus measures which reduce transport costs could encourage economic performance in various ways. Businesses can pass on the benefit of lower production costs to consumers in the form of lower prices, or they can implement further efficiency improvements by reorganising production and distribution. The economy can also benefit if lower transport costs help stimulate easier transfer between jobs, or greater competition among firms.

We consider these theories, which deal with the linkages between transport improvements and economic activity, to be strong. They are internally consistent, and provide insight into a complex pattern of effects leading in different directions, not all of which are intuitively obvious – notably, for example, the ‘two-way road’ argument: this reminds us that improved accessibility between two countries (and, similarly, between cities, areas or regions) may sometimes benefit one of them to the disbenefit of the other. We emphasise that these theories as a whole should be subject to empirical testing before any of them can be taken as proved.

In the search for empirical evidence, we find that direct statistical and case-study evidence on the size and nature of the effects of transport cost changes is limited. Some authors have claimed that national programmes of public investment, including road construction, lead to high rates of social return measured in terms of economic growth and productivity improvement. Other authors suggest that such effects do occur but on a smaller scale than has been claimed, and that, in general, any contribution to the sustainable rate of economic growth of a mature economy, with well-developed transport systems, is likely to be modest.
Our investigations support the latter assessment. We have also reviewed available evidence from specific local studies seeking to detect economic impacts from completed transport investment projects in the recent past. The state of the art of this important field is poorly developed and the results do not offer convincing general evidence of the size, nature or direction of local economic impacts.

Thus we are provided with a strong theoretical expectation that all or part of a successfully achieved transport cost reduction may subsequently be converted into a range of different wider economic impacts. This, in principle, provides for the possibility of improved economic performance. Empirical evidence of the scale and significance of such linkages is, however, weak and disputed. We conclude that the theoretical effects listed can exist in reality, but that none of them is guaranteed. Our studies underline the conclusion that generalisations about the effects of transport on the economy are subject to strong dependence on specific local circumstances and conditions.

A.7.4 Impacts of transport investment in promoting regional development

SACTRA identifies the ‘two-way road problem’ as a key issue in attempts to promote regional development (typically in relatively ‘disadvantaged’ regions) by means of transport investment within the region and between it and other regions.

Improving transport links to a region identified as depressed or disadvantaged may result in investment and/or employment opportunities flowing into the region. However, equally, people, jobs (and perhaps investment) may flow out of the ‘target’ region because of the improved access to other centres by roads and other transport links.

In assessing the likely regional impacts (in terms of under what conditions transport investment will benefit the ‘target’ region and under what conditions there would be an outward flow of investment and jobs), SACTRA suggested the following key issues that would be relevant:

- scale economics (for example, Where these dominate, lower transport costs thorough improved accessibility may encourage an increased concentration of firms in core regions until the point that diseconomies set in)
- size of the local market
- local land and labour conditions
- the nature of backward and forward linkages in the local economy
- the nature and scale of transport improvements.

However, SACTRA also noted that the interplay of these factors is ‘indeterminate’ — that is, it is impossible to predict outcomes using theory alone. It concluded that “the impact of improved transport links on regional economies is context specific and must be assessed on a case by case basis. It stated that:

..there is no guarantee that transport improvements will benefit the local or regional economy at only one end of the route – roads operate in two directions and in some
circumstances the benefits will accrue to other competing regions…assessment of whether economic impacts will actually benefit the intended target area will need to consider impacts outside the immediate neighbourhood…greater attention should be paid to the question of where the impacts will occur and on whom they will fall.
Appendix B: Description and explanation of ‘wider economic impacts’ of transport investment

B.1 Introduction

In recent years, there have been significant developments in the theory and practice of socio-economic appraisal (based on cost-benefit analysis) of transport system investments. These have involved the consideration and quantification of a set of wider economic impacts (WEI), which had not previously been considered in transport sector economic appraisal.

These developments have largely originated from the UK, but have since been adopted for appraisals in other countries, including New Zealand: the NZ Transport Agency’s Economic Evaluation Manual now contains procedures for estimating the following WEIs: agglomeration impacts, imperfect competition impacts and labour supply impacts (EEM 2013, A10.2).

This appendix described each of the WEIs that are now being included in socio-economic appraisal (cost-benefit analysis) in UK and some other countries (including New Zealand), specifically:

- labour market effects
- agglomeration effects
- competition effects.

B.2 Defining wider economic impacts

Transport investment has a significant impact on where economic activity occurs. Over time, changes in access and mobility can lead to changes in the economic and social landscape of countries. It can influence the geography of agricultural production, manufacturing and the knowledge-based service sector through its impact on how easy and cost effective it is to move around. Transport costs and accessibility also influence where people choose to reside in relation to their place of employment and lifestyle preferences.

The quality of transport infrastructure, in terms of amenity and aesthetics, plays a role in the overall liveability and attractiveness of cities. Modern thinking in economic geography describes cities as competing with each other (within and between countries) to attract highly-skilled people who can choose where they decide to live and work. One response to this competition is the investment that goes into major transport hubs around the world, which go beyond their utilitarian purpose and are designed to make a statement about the cities they service.

Therefore, as Weisbrod and Baird (2008) suggest, there is a “growing appreciation that the effects of transport on the economy can be significantly ‘wider’ than has been recognised by transport evaluation methods.”
The definition of wider economic impacts generated by transport is best summarised as:

"Wider impacts are those not captured in standard cost-benefit analysis, including effects relating to returns to scale, thickening of labour markets, and market power, as well as firms’ and households’ behavioural adaptations to changes in transport costs."

The remainder of this appendix discusses three key wider economic impacts: labour market effects, agglomeration and transport network (competition) effects. These three wider economic impacts are all significant long-term links between transport and the economy. They may each contribute to long-term economic growth and development through their influence on productivity and the geographic distribution of economic and social activity.

**B.3 Labour market effects**

Transport investments lower transport costs and, in turn, influence the costs and benefits associated with labour market decisions. Travel costs associated with the journey to work are an important aspect in an individual’s decision on where to live and which job opportunities to pursue. The costs of travel — which can include the time required, and the overall experience of travel, as well as the financial cost — are weighed against the remuneration from employment and accommodation costs. Improvements in transport links are therefore likely to influence the labour market on both the demand and supply side.

The significance of transport costs and accessibility can be observed through the international migration of manufacturing. As worldwide transport costs have fallen, the global economy has seen a shift in the location of labour-intensive production towards developing countries, where wage rates are lower.

Krugman (1999) demonstrates that if transport costs are high then external trade is relatively constrained and wages depend on the local level of competition for labour and jobs. However, if transport costs are lower, employers have access to a larger labour market and a wider range of skill levels, which can increase competition for employment.

Transport costs and transport links can therefore influence the distribution of employment both within a country and between countries. They can also influence wage rates and the types of jobs that are available in a country or location. There is also significant potential for redistributing jobs within the labour market. Jobs created in one region could mean a loss of jobs in another region, and the employees may not be transferred with the position. Overall there is no change in total employment. Understanding whether the jobs created in the transport investment’s region are new positions, or a redistribution of existing positions, is an important input in the evaluation of economic development impacts.

These labour market impacts influence economic growth, economic development and economic efficiency.
B.4 Agglomeration effects

The term ‘agglomeration effects’ is used to describe the impact of the co-location and increased spatial concentration of related firms. These effects can be a source of productivity gains, specialisation, knowledge spillovers and increased human capital. Therefore, agglomeration can have significant influence on long-term economic growth and economic development. Transport is a crucial factor in the extent of agglomeration effects.

Proximity allows firms to increase access to intermediate suppliers and enhances the opportunity to specialise. Spatial concentration also induces labour market pooling and allows people to be exposed to new skills and techniques that enhance productivity. Spatial concentration thus provides firms with the opportunity to benefit from increasing returns to scale. Agglomeration effects can be self-reinforcing, which further encourages economic development.

Transport infrastructure and services play a pivotal role in the incidence of agglomeration effects through improved access and supply. Transport infrastructure and services can reduce the effect of distance by reducing the cost of transport and increasing the speed of travel. Mare and Graham write:

Transport provision is an extremely important determinant of accessibility and thus exerts a crucial influence on the level of agglomeration experienced by firms. Where there are constraints in the transport system, or where the system works inefficiently, we would expect negative consequences for the generation of agglomeration economies. When we make new investments in transport we change the economic mass that is accessible to firms with positive consequences for the agglomeration economies these firms enjoy.

B.5 Competition effects

Different views are held about competition effects. The traditional argument is that effective barriers to entry due to high transport costs create monopoly power for existing firms. Reductions in transport costs are pro-competitive and so produce a wider benefit. Another argument is that competitive pressure may force some firms to exit the market; therefore, lower transport costs may reduce the number of competing firms in the long run (ITF, 2008, p.40).

The NZ Transport Agency (2011) discusses the competition benefits resulting from reduced transport cost under two headings: ‘imperfect competition benefits’ and ‘increased competition benefits’.

Imperfect competition generates increased output where there are price cost margins. A transport improvement drives down prices and therefore demand expands. This leads to a reduction in the societal ‘dead-weight’ loss that occurs when price cost margins exist. In other words, conventional cost-benefit analysis assumes the existence of perfect completion where price equals marginal costs, so the value of additional output due to cost reduction is identical to marginal cost of labour or marginal wage. However, if price cost margins exist they, by definition, cause a wedge between the hourly gross labour costs and the market value of what is produced in that hour. Therefore, where there are price cost margins, a transport-induced increase in output will cause a wider economic impact identical to the size of this wedge.
Increasing the levels of competition means there will be additional benefits by pushing the economy toward its optimum position and reducing the overall deadweight loss to society by increasing output and reducing price, and eroding market power from monopoly or oligopoly and other forms of market failure.

As the Brookings Institution transport economist Clifford Winston\(^\text{23}\) notes:

> An efficient and extensive transportation system greatly enriches the standard of living in modern society by reducing the cost of nearly everything in the economy; expanding individuals’ access to and choices of employers and employers’ choices of workers; enabling firms and urban residents to benefit from the spatial concentration of economic activities, referred to as agglomeration economies; reducing trade costs and allowing firms to realise efficiency gains from specialisation, comparative advantage, and increasing returns; and limiting firms’ ability to obtain market power by locating in geographically isolated markets with no competition.

> Transportation... can be thought of as a merit good – that is, societies generally believe that citizens are entitled to accessible transportation to experience a decent quality of life no matter where they live, even if the cost of the service must be subsidised. To this end, both the public and private sector have provided and managed transportation throughout... history and government policy has redistributed transportation resources across households with different incomes, between residents of urban and rural areas... and between users of a specific service and general taxpayers.

> The fact that this sector is so large and simultaneously so intertwined with virtually all other sectors in the economy suggest it is vital to assess the performance of the transportation system and to consider how it could be improved.

As Sir Rod Eddington\(^\text{24}\) said:

> A good transport network is important in sustaining economic success in modern economies: the transport system links people to jobs; delivers approach to markets; underpins supply chains and logistics networks; and is the lifeblood of domestic and international trade.

As the Eddington report also noted:

> When users experience an improvement (or worsening) of [transport] characteristics, they feed through to impact on the economy through a variety of mechanisms – increasing business efficiency, investment and innovation, improving the functioning of agglomerations and labour markets, introducing competition, increasing trade and attracting globally mobile resources.

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It is also clear that some of these microeconomic drivers are becoming more significant: notably the importance of reliability grows with widespread adoption of just-in-time management techniques; the importance of urban areas as centres of highly productive service and industry growth means an increasing role of transport in supporting agglomeration economies; and transport’s role in facilitating trade and attracting and retaining globally mobile resources becomes ever more important in a globalising world.