

Road freight: Its significance for regional economies

Road Transport Forum



April 2003



Table of Contents

Executive summary	3
Conclusions	4
1. Introduction	6
Aim	6
Background	6
Approach.....	6
2. The economic importance of transport	8
The importance of road transport to the Southland region	9
Primary sector transport demands	12
Road freight spending by Tauranga firms	13
Freight cost trends	15
Road user charges	17
3. Review of the literature	18
Economic geography.....	18
Regional development in New Zealand.....	19
Transport costs and regional inequalities	19
Time – a key transport variable	20
4. Benchmarking transport costs.....	22
Freight content	24
Conclusion	24
5. Case studies	26
Use of road versus rail.....	26
Freight content	27
Sensitivity to relative land transport costs	27
Transport costs and investment decisions.....	28
The importance of transport	29
Conclusion	29

Executive summary

1. The purpose of this study is to provide background data and analysis of the relevance of land transport to regional economies. The work covers the role of transport generally and more specifically in regional economies. It also provides a brief review of relevant literature, an assessment of how transport costs vary from major centres to regions, and finally some firm-level views of land transport issues based on four case studies.
2. Transport has been one of the fastest growing areas of economic activity over the past decade. GDP and road user charge data point to annual growth of more than 5%pa (real terms).
3. Land transport has grown in economic significance for two important reasons:
 - Increased efficiency of land transport as a result of better technology, more efficient management and better roads.
 - Greater concentration of economic activity:
 - Economic agglomeration around Auckland
 - A drive for scale and economic efficiency in the primary processing sector
 - Rationalisation of international transport - ports, airports, shipping companies and airlines.
4. Road transport is particularly important to primary industries in regional economies. In Southland's forestry sector, for instance, road transport accounts for 13.2% of all costs. For all industries road transport accounts for 2.1% of total costs in Southland, but just 1.3% for New Zealand as a whole.
5. Road transport output prices have remained relatively stable in nominal terms over most of the 1990s. They have certainly remained more stable than other transport costs and the cost of most other goods and services. The real cost of transporting goods by road has fallen in direct price terms and also in terms of speed, reliability and service.
6. Transport costs rise as the distance from the point of distribution increases. Transport costs for goods delivered to Invercargill are, on average, 4.5 times higher than they are for the same goods distributed in Auckland.
7. Transport costs, though, do not rise directly in relation to distance travelled. Loading time, bigger and more efficient trucks used over longer distances, ability to back-load or round trip load, discounts for longer term line-haul contracts and increasing congestion in major centres all contribute to a more complex pricing structure than a simple tonne/kilometre rate might suggest.
8. The freight content of goods ranges widely from less than 1% for higher value final consumer goods to around 15% for lower value bulk products/ raw materials.



9. Based on four company case studies there is a definite shift in transport preferences from rail to road. Price is not the issue. Rail is seen as unreliable and lacking in service – for one company Tranz Rail removed services altogether.
10. Changing the relative price of rail versus road transport would not persuade companies to switch transport modes. Generally, they would make other changes to their business to avoid having to rely on rail. However, one company would use rail for a third of its transport requirements if rolling stock was made available at a price that was competitive with road transport.
11. Within the list of business concerns faced by companies transport issues rate around the middle in terms of significance/ priority. From time to time transport will rise to the top of the priority list.
12. Transport is an important, but not necessarily crucial element in making new investment/ plant location decisions. However for some regions transport (including road access) is a critical issue in attracting new investment.

Conclusions

- Transport is significant for regional economies because it represents a major input to those businesses at the forefront of generating regional incomes: the major resource-based industries, forestry farming, horticulture, mining and fishing.
- Road transport accounts for a larger share of economic activity in regional economies than for the economy as a whole implying that the road transport content of largely urban economies is significantly lower than rural regions. Input output data covering Southland indicate that road transport accounts for around 2.5% of economic activity in that region compared to around 1.4% nationally.
- A rise in the relative cost of road transport would tend to reduce regional incomes in two ways:
 - primary sector incomes are generally residual incomes, so any increase in the cost of sale would reduce their income;
 - and secondly, the cost of final consumer goods, which are generally imported to the region, would rise.
- Rail does not offer New Zealand businesses a commercially attractive alternative to road transport despite the fact that rail freight rates are very competitive. In many cases regional rail services are limited or non-existent.
- From the case studies undertaken as part of this study the message is that almost no matter how big the price differential between road and rail becomes, firms will still be compelled to use road transport to meet customer requirements of timely and secure deliveries.
- With regions becoming increasingly reliant on efficient land transport services, any increase in the cost of that service would have a negative effect on regional economies. In the short term household

and business incomes would be reduced and in the medium term businesses may relocate closer to major centres of economic activity.

- Rising transport costs within Auckland because of congestion are also forcing firms to contemplate expanding production outside New Zealand.



1. INTRODUCTION

Aim

The Road Transport Forum has commissioned the following work to help inform the development of a transport strategy for New Zealand.

The aim of the work is to gather firm-level data and insights about the significance of transport costs to regional economies, and the possible consequences for regional industries and businesses and their investment decisions of any major changes in relative transport costs.

Background

New Zealand's remoteness from major markets has long been argued to be a major business disadvantage. The same may well be true for businesses operating in the provinces of New Zealand, where transport costs to the major domestic markets can account for a significant share of the final cost of goods.

But just how important are freight costs to regional businesses and those trying to maintain a national supply network? The answer obviously varies depending on the type of good and how far it is being transported.

Cost is not the only consideration when looking at transporting goods to and from remote locations. Time, flexibility care of the product and reliability (in total, service) are all important factors in weighing up what mode of transport to use, and even where to site distribution and manufacturing centres.

Generally regions export low value bulk products (mainly primary sector related) and import higher value consumer products, which tend to have a low transport content. Historically, high transport costs (in the widest sense) in and out of regions meant that regional economies were much more self sufficient than they are today – bread was baked, and beer was brewed, locally. Furthermore, milk and livestock were processed locally.

As roads and trucks have improved (reliability, safety, efficiency, etc) businesses have been able to concentrate production and processing to capture economies of scale that more than offset the additional transport costs involved in freighting goods over longer distances. Hence the steady decline in the number of regional businesses and relative performance of many regional economies. The rationalisation in the dairy industry over the past 20 years is probably the most obvious example of this transformation of regional economies.

Transport and storage services account for around 5% of GDP. Over the past 10 years the transport component of GDP has grown faster than overall GDP reflecting a number of broader economic trends including outsourcing and just-in-time supply chains. Road transport costs have remained remarkably stable in nominal terms since 1990.

Approach

Our approach is first to identify the transport/freight component of economic activity via the input-output tables at a national and at a regional level.

We examine the literature relating to transport costs and how they impact on regional economic development. The most relevant literature relates to international studies that are not necessarily directly applicable to the New Zealand context but nonetheless shed light on some of the issues important to this study.

Thirdly, we benchmark the transport costs vis a vis Auckland for a number of products and for three regions – Bay of Plenty, Wellington and Southland. The aim of this area of work is to highlight the increased significance of transport for more remote regions and their businesses.

Finally, we have undertaken four case studies of significant regional businesses to identify the importance of transport costs and the implications for their business of possible changes in freight rates. In particular we have pressed the selected businesses to indicate what changes in production, investment and transport services might occur should the relative cost of road freight rise by 10%.



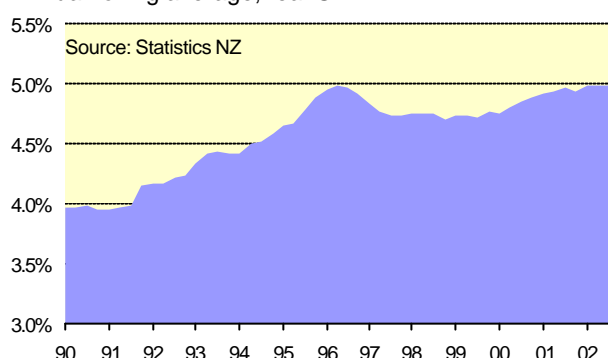
2. THE ECONOMIC IMPORTANCE OF TRANSPORT

In this section we examine the importance of transport in the general economy as well as at a regional level.

In the national economy transport and storage activities account for around 5% of total gross domestic production (GDP). Transport's share of GDP is now back to the level reached at the height of the mid-1990s economic boom, and is well ahead of where it was at the beginning of the 1990s (4% of GDP).

Transport/storage share of GDP

Annual rolling average, real GDP



Graph 2.1

Transport sector activity has grown at more than 5%pa for the past decade and is currently growing at over 6%pa in real terms. This is consistent with road user charge data (see below). The current rapid growth in transport activity reflects strong growth in domestic demand as well as healthy growth in primary sector output over 2002.

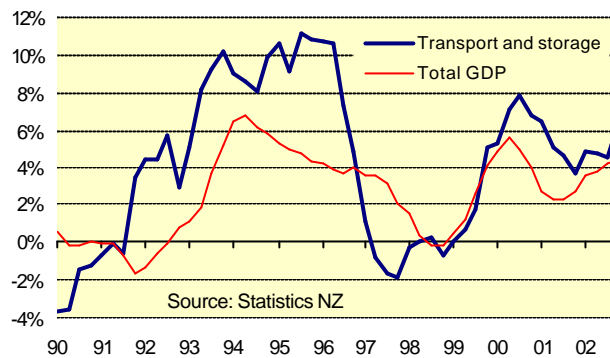
At least some of the growth in transport sector output reflects the ongoing rationalisation of production in key industries – milk, meat and wood processing, being the most significant. Greater centralisation of processing facilities, as well as distribution, has led to greater demand for transport services, particularly road and rail.

Furthermore, the quality and cost of transport services have generally improved over the past decade or so reflecting investment in new technology (especially electronic management of trucks, despatch systems and logistics management), better roads and the reform of road rail and port businesses.

As we discuss below land transport costs have fallen in real terms since 1990.

Real GDP growth

Year end % change, 1995/96 prices



Graph 2.2

The importance of road transport to the Southland region

To establish the importance of transport to regional economies we have sought regional input-output data for Southland. A finite budget precludes obtaining such comprehensive data on more than one region at this stage. A general finding is that Southland is more reliant on road freight transport than is New Zealand as a whole.

Road freight companies account for 61% of all land and sea transport revenue in the Southland region. For New Zealand as a whole, the comparable figure is 55%. It is unsurprising that relatively little freight in the region goes by rail (the network is not extensive in the far south) or sea (Bluff is not a major sea port).

Table 2.1 shows the contribution road freight transport makes to the Southland and New Zealand economies¹.

¹ Southland numbers were generated for the year ended March 2001, using detailed employment data from Statistics NZ to update the national 1995/96 input-output table, then calculating Southland numbers using a variant of the GRIT methodology (refer to Butcher Partners).

New Zealand numbers are directly from the 1995/96 input-output table. National employment statistics are from the 1998 Annual Business Directory Update (ABDU), the last ABDU to include on-farm employment.

Using different time periods is thought to make little if any difference to the coefficients in the Leontief matrix calculated from the input-output table, so multipliers should not be affected. In other words, multipliers are comparable.

The different time periods could make a difference to the 'direct contribution to the economy' measures, however. To the extent that road transport might have become a more prevalent industry in the economy between March 1996 and March 2001, the New Zealand (1996) numbers would tend to be lower than the Southland (2001) numbers. Nevertheless, the differences are so large that it still seems safe to attribute a greater role to freight transport in the Southland economy.

As a 'sanity check' we can look at strictly comparable 1998 employment data: 2.0% of Southland employment was provided by the road freight transport industry, while just 1.5% was provided by that industry across New Zealand as a



Economic contribution of road freight transport

Year ended March 2001, % of all industry total

	Southland region	New Zealand
Gross output	2.5%	1.4%(2)
Value added (1)	2.6%	1.4%(2)
Employment (FTEs)	2.4%	1.5%(3)

Source: Butcher Partners, Statistics NZ

1 At factor prices

2 Year ended March 1996

3 Year ended February 1998

Table 2-1

The major user of road freight services in Southland is the meat processing industry. According to Butcher Partners' estimate, nearly a quarter of all demand for road freight services comes from the meat processing industry (see Table 2.2).

Other primary product manufacturers are also an important source of freight business. Forestry and logging, seafood production, dairy processing and basic metals (the Tiwai Point smelter) all figure prominently, though forestry less so than nationally.

Major road freight transport users

	Southland region 2000/2001 % of sales	New Zealand 1995/1996 % of sales
Meat processing	26.6%	8.0%
Sold to other road freight companies	21.3%	17.8%
Users outside the region	12.9%	2.1%
Wholesale trade	6.9%	18.3%
Basic metals	5.9%	1.9%
Forestry	4.2%	9.0%
Sheep and beef farming	2.9%	1.2%
Log sawmilling	2.0%	1.5%
Seafood processing	1.8%	1.6%
Dairy product manufacturing	1.5%	1.5%
Other	14.0%	37.1%

Source: Butcher Partners, Statistics NZ

Table 2-2

A high proportion of Southland's road freight business is exported from the region (i.e. services are provided to businesses based in other parts of the country). Almost 13% of Southland's road freight sales came from businesses outside the region.

whole. In 2001, 3.1% of non-agricultural employment in Southland was provided by road freight companies, compared to 1.5% across the whole of New Zealand.

The wholesale trade sector is one of the most important sources of demand for road freight services at a national level, but is comparatively unimportant in Southland. This is an economy that relies heavily on road freight transport to get its products to market, rather than to bring products in for domestic consumption, via wholesale and retail distribution channels.

For most industries, the purchase of road transport services is a small part of total costs (see Table 2.3). However, 13.8% of goods and services costs in the forestry industry in Southland are road freight transport costs. Road transport costs are also a substantial proportion of total costs in other primary production industries, and in some parts of the chemical industry. Road transport is 2.1% of total industry goods and services costs in Southland, versus 1.3% for New Zealand.

Industries where road transport is a major cost

	Southland region 2000/2001 % of expenses	New Zealand 1995/1996 % of expenses
Forestry	13.8%	10.9%
'Other' industrial chemical manufacturing	7.1%	6.2%
Meat processing	4.3%	4.4%
Wholesale trade	3.5%	3.2%
Seafood processing	3.4%	3.2%
'Other' non-metallic mineral manufacturing	3.4%	2.8%
Log sawmilling and timber dressing	3.3%	2.8%
'Other' food manufacturing	3.2%	3.0%
Glass and ceramic manufacturing	3.1%	2.6%

Source: Butcher Partners, Statistics NZ

Table 2-3

Indirect economy wide effects

While direct sales and purchase data says a lot about the importance of an industry to an economy, its effect can extend beyond a single industry. When an industry grows, it increases its purchases from suppliers, and their purchases from their suppliers increase, and so on. A 'Type I Multiplier' measures the effect that an extra dollar earned by an industry would have on the entire economy, after this chain of purchase and supply has been followed to the end.

A 'Type II Multiplier' also includes the downstream effects of the increased household income that results from more sales in industry.

Multipliers are generally lower for the Southland economy than for the New Zealand economy as a whole (see Table 2.4). We put this down to 'leakage' – much of the additional spending created by an extra dollar of revenue in an industry ends up outside the Southland region. Intuitively, Southland is less self-sufficient in production than the country as a whole.

Nevertheless, road transport industry multipliers are amongst the highest of those in 114 industries in Southland, and the relative sensitivity of the



economy to road transport revenue is higher in Southland than in New Zealand as a whole.

Multipliers do not take account of possible 'trade diversion' effects. For example, a growing transport company might require more staff, some of whom would then not be available for other jobs, perhaps restricting growth in other areas.

Road freight transport multipliers

Year ended March 2001

	Southland		New Zealand	
	Multiplier	Percentile(1)	Multiplier	Percentile(1)
Gross output Type I	1.55	86%	1.90	64%
Gross output Type II	1.74	87%	2.55	70%
Value added Type I	1.59	82%	1.90	58%
Value added Type II	1.80	82%	2.58	54%
Employment Type I	1.73	82%	2.07	63%
Employment Type II	1.96	82%	2.79	62%

(1) The percentage of 114 industries in the region that have lower multipliers

Table 2-4

Primary sector transport demands

The transport requirements for many regions are dominated by the primary sector where bulk products must be transported to processing plants either somewhere inside the region or beyond the region. The most obvious products requiring transportation include:

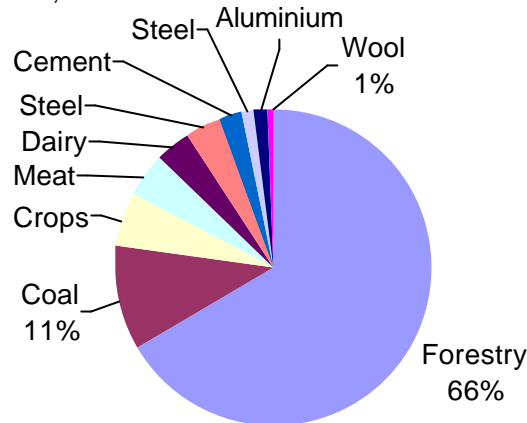
- wood
- milk
- livestock/meat
- wool
- horticulture products

Forest products account for roughly 2/3rds of the total weight of primary production (see Graph 2.3) and therefore dominate the demand for transport services in many primary-intensive regions.

In some cases, particularly milk and livestock, time and reliability are critical aspects of the transport services demanded. As transport services have improved primary processing facilities have become more concentrated thereby increasing the demand for and reliance upon land transport.

Share of total production weight

Annual total, 2000



Graph 2.3

The data behind Graph 2.3 are consistent with data collected by Priority One in the Bay of Plenty covering transport spending by firms in the region (see next section).

Road freight spending by Bay of Plenty firms

As part of this study, Priority One (Western Bay of Plenty Districts economic development agency) undertook a survey of local firms' road transport activities. Data was collected on the volume of freight carried in and out of the Bay of Plenty on the main highways.

We would caution against reading too much into the absolute dollar numbers in Graph 2.4, because the data is a sample rather than a census (the sample covers at least 80% of the transport services in and out of the region). The main value of the data is that it provides some indication of the relative significance of transport in a range of industries.

The data are consistent with our derived aggregate numbers in the previous section and also with the input-output data for Southland. Forest products account for a large chunk (nearly 60%) of transport activity within Bay of Plenty's road freight sector reflecting the significance of forestry to the region's economy. Pastoral farming and horticulture and related food processing account for around 20% of the area's total spending on road transport services.



Economic contribution of road freight transport

Year ended March 2001, % all industry total

	Bay of Plenty	Southland	New Zealand
Gross output	1.9%	2.5%	1.4%
Value added	1.7%	2.6%	1.4%
Employment	1.6%	2.4%	1.5%

Source: Butcher Partners, Statistics New Zealand

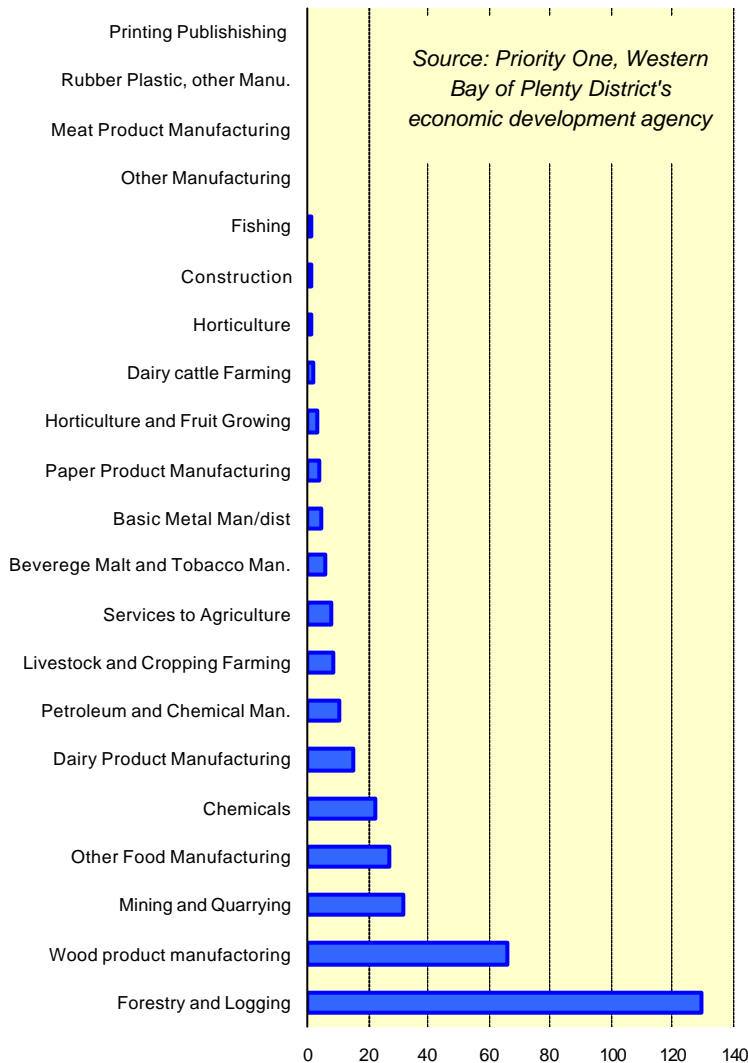
See Table 2.1 for detailed notes

Table 2-5

Input-output data for the Bay of Plenty region (Table 2.5) show that road freight activity accounts for just under 2% of total economic activity. That is higher than for the economy as a whole, but lower than in Southland (see Table 2.1). Part of the reason for why road transport accounts for a smaller share of total economic activity in the Bay of Plenty than in Southland is the relative importance of rail freight to the Bay of Plenty region.

Road transport spending - Bay of Plenty

\$m latest financial year



Graph 2.4

Freight cost trends

Freight costs are an important factor in determining business location and indeed the concentration of economic activity (see the next Chapter). The lower transport costs are, the less important distance is in determining the location of economic activity. That is most clearly evident in looking at international transport costs.

The latest OECD country report on New Zealand pointed out that: "being a long way from markets is not much more costly than just a medium distance away". Furthermore they also noted that "international transport is typically only a third of door-to-door shipping costs, partly because it is so cheap: by one estimate, an additional kilometre of overland transport costs seven times as much as an additional kilometres by sea"². The implication here is that it may be as cheap to ship goods from New

² OECD Economic Survey: New Zealand, 2002, p108



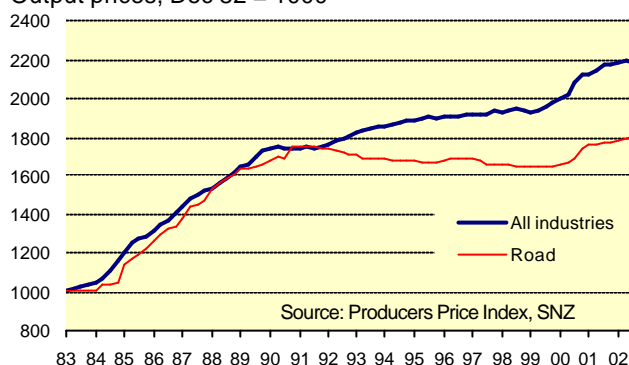
Zealand to the west coast of the US as it is to ship the same good from Detroit to California, or from Dunedin to Auckland!

The focus of this report is land transport. So, what has been the trend in land transport costs in New Zealand over the past twenty years? Output data from Statistics New Zealand's producer price indices indicate that road transport costs stabilised around the early 1990s and declined relative to all other output costs between 1991 and 1999.

Although road transport output prices have risen since 1999, the extent of the increase has been less than that for all industries and for the transport sector as a whole, see Graph 2.5.

Stable road freight costs

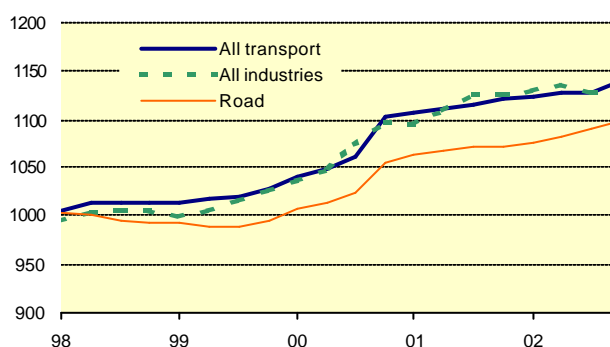
Output prices, Dec 82 = 1000



Graph 2.5

Road freight rates rise slowly

Output prices Dec 97 = 1000



Graph 2.6

These trends indicate that the cost of freighting goods by road has fallen relative to other forms of transport, and also in relation to most other producer output prices (see Graph 2.6).

The relatively stable trend in nominal road freight costs over the 1990s means that real road transport costs have fallen. This trend should have favoured regional economic development, or at least helped regions retain businesses. The fact that businesses have continued to migrate to

the major population centres despite the fall in real road transport costs suggests one of two things:

- either transport is not a particularly significant factor in location decisions
- or the exit of businesses from the regions would have been even greater had it not been for the fall in the real cost of road freight services.

Road user charges

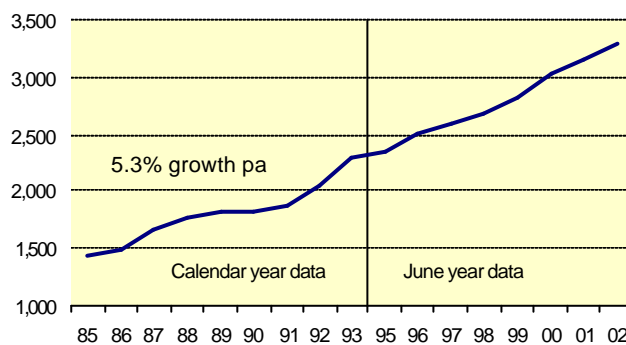
There has been a steady (5.3%pa) increase in the kilometres of road user charges (RUC) purchased by road freight operators over the past fifteen years. The lift in the "volume" of road freight being carried was strong between 1992 and 1994 and the pace of growth picked up again over 1999 and 2000. The RUC data is consistent with GDP data showing 5%pa growth in the real value of transport sector output.

The rise in freight "volumes" reflects not only more cargo being shifted, but also cargo being transported over longer distances. The concentration of milk processing, for instance, has significantly increased the distance the average litre of milk is transported from farm to factory.

Over the next three to five years a marked increase in the volume of wood harvested will also push up the quantity of RUC purchased.

RUC kilometres purchased

Heavy trucks and trailers, millions of kms



Graph 2.7



3. REVIEW OF THE LITERATURE

Economic geography

The effect of transport costs on the economic development of regions, especially those some distance from the centres of economic activity, is an important aspect of economic geography literature.

A treasury working paper – Economic Geography – Key Concepts³ – provides a valuable summary of the main aspects of economic geography in the context of New Zealand's economic development.

Transport costs are recognised as one of several important forces that firms can, to some degree, control, that have a bearing on where firms choose to locate. Because transport costs are generally lower the shorter the distance travelled, transport becomes an important factor encouraging the concentration of economic activity.

The author of the paper points out that firms will tend to gain benefits from locating in major centres of economic activity. There are three categories of benefit: transport costs, economies of scale and scope and informational externalities (the benefit of being in the midst of a lot of information some of which will be particularly relevant to a business).

"The cost of transporting goods and services to market can be an important consideration for firms and individuals when making a location decision. If transport costs are high they may feed through to higher prices for the good or service and subsequently affect demand – this may provide impetus for activity to locate somewhere with lower transport costs. Transport costs are lower in agglomerations due to the smaller distances to both suppliers and final consumers. Cities are also often the hubs of transport networks, again making transportation cheaper and easier and lowering overall costs for businesses.

Low transport costs also help to encourage specialisation, as it becomes possible to serve a larger market more cheaply – essentially enlarging the total market size. As transportation costs have fallen over time their effect on location decisions has reduced in relative importance. However, they remain a part of the overall story of agglomeration."

Sarah Box – the author of the Treasury paper - also argues that road congestion can be a factor that leads to the dispersion of economic activity. As roads become unduly congested companies may look elsewhere to expand production. Fisher & Paykel recently noted that congestion in Auckland was forcing it to reconsider where it would invest to expand production⁴.

³ Sarah Box "Economic Geography - Key Concepts" Treasury working paper 00/12, 2000.

⁴ "Auckland's gridlock stunts growth", The Independent, 19 March 2003, page 1.

Regional development in New Zealand

In 2000 the Government initiated a study⁵ of the Gisborne region's economy with the aim of developing a plan to spur growth in the region. A part of that study related to the critical role of transport in developing the region's two main industries - forestry and agriculture. The region is one of the more remote in New Zealand and its topography makes land transport difficult and costly. The existing road infrastructure emerged as the largest single barrier to economic development for the region, thus highlighting the importance of transportation services to economic growth.

The emphasis, in terms of recommended solutions, tended to revolve around the upgrading of the road network. Although it is not made clear why the emphasis is on roads, our interpretation is that roads offer a wide range of transport options and are an essential rather than simply a desirable component of transport infrastructure.

Transport costs and regional inequalities

Economic geographers argue that a reduction in inter-regional transaction (transport) costs combined with increasing returns to scale, encourages both labour and capital to move from regions to the major centres of an economy. The economic centres benefit from larger markets with a bigger range of goods and services, which increases both consumers' utility and firms' productivity⁶.

Combes and Lafourcade⁷ appear to contradict the above argument. In a report published earlier this year, based on analysis of French data the authors estimate that a 30% reduction in transport costs leads to a 21% decrease in the concentration of production and a 32% decrease in the concentration of employment. They go on to observe, though, that "agglomeration mechanisms simultaneously strengthen specialisation within a large number of the 22 French *administrative regions*, yielding there the development of competitive and dense *economic areas* at the expense of others".

In other words lower transport costs, *all other things equal*, tend to produce a duo-centric concentration of economic activity – they stimulate economic concentration at the centre as well as at the periphery. Regions experience some increased concentration of activity.

Part of this "U" shaped response to lower transport costs reflects the fact that labour and capital costs are generally lower the further from the economic centre one goes. And while these cost differentials are offset to some degree by scale and diversity advantages at the centre, a reduction in transport costs presents firms with the opportunity to immediately capture the benefits of lower primary input costs. Scale and diversity advantages at the centre are less obvious in the short term.

⁵ Ministry of Economic Development "Report on the Tairāwhiti Development Taskforce" November 2000.

⁶ Paul Krugman, "Increasing Returns and Economic Geography", *Journal of Political Economy*, 99 p483-499, 1991.

⁷ Pierre-Philippe Combes, Miren Lafourcade, "Transport Costs, Geography and Regional Inequalities", *Journal of Economic Literature*, January 2003,



If there are strong gains being achieved in scale, market depth and diversity at key centres of economic activity these would more than offset the dispersing effects of improved access to lower labour and capital costs as transport rates fall.

Nonetheless, logic would suggest that as transport costs fall toward zero far-flung businesses are able to take full advantage of their much lower labour and fixed costs and attract economic activity away from major economic centres. We can see examples of that in the world economy in services – software development being subcontracted to India.

The above points are very relevant to this study for two reasons:

- Firstly, an important objective of this study is to examine the importance of transport costs to regional economies, and the possible consequences for industry and business investment of any major changes in transport costs.
- Secondly, as we have set out in Chapter 2, land transport costs in New Zealand have fallen significantly over the past decade or so.

The fall in transport costs has occurred simultaneously with an obvious concentration of economic activity in the main centres, particularly Auckland, suggesting that lower transport costs may have played a part in driving the agglomeration process. At the same time the cost of labour and a range of capital (buildings and land) in the regions has fallen relative to the cost of those same factors of production in the cities. It would seem that the gains from agglomeration in New Zealand, in conjunction with falling transport costs, have easily outweighed the dispersing effects of higher living, labour and capital costs in the places like Auckland.

There is little, or no, evidence that falling transport costs in New Zealand are producing a duo-centric concentration of economic activity as Combes and Lafourcade found in their analysis and simulation of French data. The French analysis, though, assumed other conditions remained constant – that is no further agglomeration benefits or change in relative prices of factors of production that might offset the effects of lower transport costs.

The authors also note that “even if geography is partly captured by transport costs and imperfect competition on segmented markets, other real geography effects (proximity to oceans, to foreign countries, climate, amenities, etc) play a critical role in the spatial shaping of economic activities”. In other words transport costs are by no means the only factor determining the location of economic activity.

Time – a key transport variable

Moving goods requires time. Hummels⁸ has looked at the importance of time as a trade barrier in international trade as well as an important factor in determining trade patterns and the location of production.

⁸ David Hummels, "Time as a trade barrier", Mimeo Krannert School of Management, October 2000.

Hummels estimates show that each day saved in shipping time is worth 0.5% of the final value of the good – approximately 30 times greater than costs associated with pure inventory holding. “These savings accrue primarily to the shipment of manufactured goods, and intermediate goods.”

Hummels also points out that “faster transport (air and faster ocean vessels) is equivalent to reducing tariffs from 20% to 5.5% from 1950-1998. Relative declines over time in air shipping prices make time-savings less expensive, providing a compelling explanation for aggregate trade growth, compositional effects in trade growth, as well as growth in time-intensive forms of integration such as vertical specialisation.”

There are at least two important implications for both the New Zealand economy and regional economies from the above:

- Firstly, declining transport costs/increasing speed have stimulated trade and led to the disaggregation of production, or, as Hummels puts it, vertical specialisation. That implies that as transport efficiency improves it opens up opportunities for regional firms to become suppliers of inputs to larger businesses in major centres.
- Secondly, it reinforces comments from companies contributing to this study that timeliness is a critical factor in determining transport modes. Improving the flexibility, reliability and speed of transport services promotes inter-regional trade.

Increasing the speed with which goods can be transported favours primarily manufacturers, according to Hummels. But improved transport efficiencies in New Zealand have also encouraged the concentration of primary processing and increased the level of competition amongst processors.



4. BENCHMARKING TRANSPORT COSTS

As part of this study we have been asked to gather data to compare the cost of getting goods distributed in Auckland with the cost of getting the same goods delivered to – Tauranga, Wellington and Invercargill. The aim of this benchmarking exercise is to establish the relative costs of transporting goods to different regions.

We have obtained data from companies distributing common consumer goods throughout the country that account for roughly 13% of all goods purchased by households (based on weightings within the consumers' price index).

The data are presented as index figures with Auckland being the base at 100. All data relate to transport rates ruling in the December quarter 2002.

Freight Costs					
Benchmarking ex Auckland					
Index, Auckland = 100					
	Product	A	B	C	D
CPI weight		0.5%	8.0%	3.0%	1.5%
	Auckland	100	100	100	100
	Tauranga	164	450	107	109
	Wellington	514	303	134	31
	Invercargill	545	784	148	359

Freight costs from nearest distribution centre or factory

Table 4-1

The data are for the final distribution step from warehouse/factory to retail outlet. It is important to recognise that companies often have more than one distribution centre or factory from which they distribute and therefore transport costs do not necessarily rise consistently the further the final retail point is from Auckland. Some goods are distributed in the first instance by sea to local ports and then delivered by road to final retail outlets. Cement and petrol are two obvious examples. The above data relate to the land component only.

Distribution costs are measured as the absolute freight cost per unit to the destinations identified. The index figures, however, provide no indication of how important freight costs are for each product – see below for a more detailed discussion of freight content.

The data are consistent with expectations – generally the further from Auckland, or primary distribution centre, the final retail outlet is, the higher the transport cost. The obvious exception is product 'D' where the distribution centre is clearly Wellington. Product 'B' also has a secondary distribution centre in, or close to, Wellington.

The marked increase in total transport costs as goods are distributed further from Auckland highlights an important economic reality faced by more remote regions. The cost of goods generally rises (a function of

higher transport costs) the further away they are consumed from the point of production.

Based on the very limited range of products set out in Table 4.1 above, Invercargill retailers and consumers face transport costs that are on average 4.5 times higher than their counterparts in Auckland. Even for a region relatively close to Auckland – Tauranga – per unit transport costs are twice what they are in Auckland (based on the limited sample we have).

On the face of it the data in Table 4.1 are not entirely consistent with the way trucking companies price their services. Freight rates are based on the weight of cargo and the distance travelled – tonne kilometres.

The figures in Table 4.1 do rise as distance from distribution point increases, but not in a very linear fashion. That is, the distance from Christchurch to Invercargill is 2.8 times the distance from Auckland to Tauranga. And yet the benchmark data suggest the cost of transporting a good from Christchurch to Invercargill varies from as low as 1.7 up to 3.3 times the cost of getting the same good from Auckland to Tauranga. The observed spread suggests that distance is by no means the sole determinant of transport costs.

There are a number of reasons why transport costs will not vary on a strictly lineal basis with respect to distance travelled:

- Some time allowance is made for loading and unloading, but generally the cost of transporting goods rises steadily with distance travelled.
- Goods carried over a long distance are likely to be carried by bigger trucks and therefore at lower per unit cost.
- Firms transporting goods over long distances on a regular basis will tend to do so under negotiated freight contracts. These are likely to result in significantly lower freight rates than would be the case for one-off shipments.
- Congestion in major centres may increase the time rather than distance component of transport costs, further weakening the linear relationship between distance and final freight costs.
- The greater likelihood of being able to back-load and round trip load long distance trucks.

Traffic congestion, particularly in Auckland, is raising the cost of transport even over relatively short distances. The Warehouse has indicated that the “supply chain costs of getting trucks across Auckland are rising. The time it takes to travel the same distance is getting longer and longer”⁹. The problem is probably best illustrated by the rising cost of taxi fares in Auckland as traffic jams increase the “waiting” component of taxi fares.

The congestion problem is accentuated by the fact that imported and exported freight is heavily concentrated on ports and airports in the major centres. Ports of Auckland account for nearly 60% (by value) of all New Zealand's imports. The rationalisation of shipping and airline movements

⁹ “Traffic snarls strangle city”, Dominion Post 7 April 2003



is forcing more cargo to be shipped internally to access the appropriate international transport systems. Wellington exporters, for instance have had to freight more product to Auckland to maintain their trans Tasman deliveries after both Air New Zealand and Qantas withdrew Boeing 767 aircraft from the Wellington-Australia route.

Freight content

If the freight content of goods is very low then transport will be an insignificant disadvantage for more remote regions. The transport content of final goods varies enormously, from well below 1% for high value relatively small/light products to over 10% for low value bulk products.

Regional economies will typically export low value resource-based bulk cargoes and import high value finished goods. The freight content of the latter goods will generally be relatively low and therefore large differences in absolute transport costs between regions will not be particularly important in determining differences in the cost of living between regions.

From a regional economy point of view transport costs represent a significant hurdle for remote businesses having to freight in low value raw materials, components and other inputs, and for local resource-based industries needing to transport product out of the region to processing centres, or export points.

We know from economy-wide input-output data that road transport costs account for around 1.3% of final goods and services costs. The percentage is higher in the regions (2.1% in Southland) and much higher for specific industries 13.8% for the forestry industry in Southland).

The benchmarking data indicate that the land transport content of finished goods at destination varies from less than 1% to nearly 12%. It is also clear that the freight content rises the further away goods are sold from the main distribution point. In one case the freight content increases from 2.3% in Auckland to around 11.5% in Wellington and Invercargill. This is entirely consistent with the rising cost of freight as distance increases.

The case studies also show that the freight content of goods varies significantly from less than 0.5% to as much as 15%.

Conclusion

- Transport costs rise as goods are delivered over longer distances. However, the costs do not rise in a strictly linear fashion with distance, reflecting: handling costs; congestion in major cities; and bigger and more efficient trucks being used for regular long hauls often incorporating some discounting of freight rates.
- The freight content of the final cost of goods is determined more by the type of product than distance from distribution points. For some goods freight content is very low and remains insignificant even as distribution distances increase. For bulkier goods the freight content of final goods costs is often many times higher for the same distribution distance as lighter more valuable goods.
- Regional economies tend to import a large proportion of high value finished goods where the freight content is low. But their income is

dependent on transporting out of the region bulky raw materials, which have a relatively high transport content.



5. CASE STUDIES

To provide an insight to individual firms' freight requirements and transport issues we undertook four case studies. Each firm had turnover of more than \$20m with a mix of both domestic and export sales.

An important aspect of the case studies was to tease out the importance of freight costs to investment and plant location decisions. Clearly the latter decisions are significant for regional economies where the entry and exit of firms can have a big bearing on how local economies perform. In addition to the case studies we also draw on the literature, especially in regard to ideas relating to economic geography and regional development.

Use of road versus rail

All four firms rely predominantly on road transport to freight goods throughout New Zealand. Sea and airfreight are not used by any of the companies to distribute product within New Zealand.

For three firms, rail offers a realistic alternative for transporting goods within New Zealand. One firm, that would ideally like to use rail for a significant proportion of its transport needs is precluded from doing so because rolling stock has been reallocated by Tranz Rail to other activities. (The company was *not* given an opportunity to pay a higher price to maintain access to rail. It was told to buy its own rolling stock – it already has several million dollars invested in rail handling facilities, which are now redundant.)

Two firms that use rail transport, do so for only a small portion of their transport requirements. Cost is not a problem – rail is generally very price competitive. The real disadvantage of rail, identified by two of the companies, is its relative inflexibility, unreliability, and poor service. For most companies certainty of delivery is imperative to maintain efficient supply pipelines and also to meet customer expectations.

One company was comfortable with the flexibility and services offered by rail for bulk cargo being transported from around Auckland to the South Island. The main drawback of rail, even for bulk linehaul cargo is the limited nature of the network. That means cargo has to be trucked some distance to suitable marshalling yards and that increases costs (double handling).

All four companies have reduced their reliance on rail over the past five to ten years. One company has been compelled (no wagons) by Tranz Rail to drop rail as a freight option. The growing emphasis on reliability of supply to underpin increasingly demanding customer service requirements appears to be the main cause for the shift in transport modes. More recently, a lack of service has been a major reason for companies turning away from rail as the preferred means of transporting product.

Freight content

We have already covered in some detail issues relating to the freight content of domestically distributed goods, using input-output and benchmark data.

We now focus on the freight content of goods being exported. As the input-output analysis for Southland highlights, a high proportion of all road transport services in regions is associated with shifting export products to processing plants and then to ports.

Two points arise from the case studies:

- Firstly, the internal freight cost component of the final *exported* good declines as additional costs such as international transport, tariffs, and foreign distribution are incurred prior to final sale.
- Secondly, exports do not necessarily go from the nearest port. In some cases it is commercially sensible to incur additional internal freight costs in order to link with more regular/timely and/or lower cost international transport services (sea and air).

Sensitivity to relative land transport costs

We asked each of the four case study companies what would road freight rates have to increase by to persuade the company to switch from road to rail. And/or outline what rail would need to do to win freight business from your company? The responses in full are as follows:

- The company does not have the option of using rail, even if it had a lower \$/t/km rate, as the network and the service do not meet our requirements in most cases. Where they do then we use them if it allows the company to meet the service requirements at "lowest total systems cost", which is the basis of our decision, not cost minimisation per se.
- There is really no trade-off in terms of price. We need a reliable service – that is, a guaranteed overnight service to main cities, door to door service for time sensitive customers.
- Rail service levels would have to increase dramatically. The majority of product must be transported temperature-controlled. When sending by rail, additional handling is required.
- It is not a question of price, we would use rail in preference to road transport if Tranz Rail would provide the rolling stock. We were significant users of rail and would have increased our rail volumes by another 30% had the service been better. But now we are unable to send any product by rail.

These comments are in line with anecdotes from a wide range of businesses with respect to land transport decisions. Relative prices are not the issue in determining the use of rail versus road transport. Timeliness and reliability are more important than cost. In some sense, of course, cost is an amalgam of actual inputs, speed, flexibility and reliability. These can all be traded off for lower freight rates.



We also asked firms what their likely response would be to a 10% lift in road freight costs all other things equal. This question relates to the possible consequences of any move by the Government to shift the relative attractiveness of rail versus road transport.

The responses included:

- reviewing the service offering to customers – look at delivering larger minimum loads, less frequently (still using trucks)
- look in more detail at back-loading opportunities (still using trucks)
- reconsider rail and shipping for bulk line-haul
- relocate production closer to centres of demand
- change where product is sourced from, even switching to imports
- simply absorb the costs in reduced margins (remain with road transport)
- are forced to use road so would look to relocate some distribution centres

The general drift of the responses is that either companies would compromise their service levels, relocate their production/supply, or reduce their profits. Any of these outcomes would have negative consequences for the economies these businesses currently operate in. Interestingly, for those companies with an option to use rail there is no evidence that price changes would persuade them to increase their use of rail.

Transport costs and investment decisions

For regional economies hanging on to existing businesses or attracting new ones is crucial to the longer-term prospects for their communities. Transport costs have a bearing on plant location and therefore on new investment and/or the retention of existing investment.

In the case studies we asked businesses how important freight costs were in recent or new investment/ plant location decisions. Given that transport costs represent a relatively low share of final goods prices we would not expect transport to be a major factor in determining where new investment takes place. The case studies generally confirm that view – freight cost differentials do not play a major part in the siting of new capacity. Population, location of existing spare capacity and centres of demand are more important.

One company, however, indicated that as capacity is exhausted freight costs will become a “decisive component of any future investment”. This highlights the fact that different issues come in and out of play in investment decision-making depending on the nature of the investment and the state of other factors, such as capacity, costs, labour, available land, etc.

The review of the literature tells us that absolutely lower labour and fixed costs are probably more important in determining plant location than transport costs. Most regions will enjoy absolutely lower labour and fixed costs, although the quality and depth of these attributes may offset some

of the simple cost differential. Furthermore, transports costs (incorporating time and reliability) may not need to be particularly high to and from regions to offset regional labour and fixed cost advantages.

The importance of transport

We asked each company to rate where transport costs came within the hierarchy of company concerns. Three put transport costs in the 2nd or 3rd quartile of concerns. One of those companies stated that total logistics costs would rate in the top quartile, but that land transport costs would be in the 2nd quartile. The fourth company rated transport in the top quartile of concerns particularly given the increased cost of transport it has incurred from having to move from rail to road transport. Transport costs are large relative to product margins for this company.

Interestingly, transport costs (in their widest sense) are becoming a significant issue for companies operating in Auckland. We know that congestion problems in major centres of economic activity act to disperse economic activity. Thus far there is no evidence of companies shifting plant or distribution centres out of Auckland to avoid the increasing costs of congestion.

But there is more interest in setting up inland ports to take road freight the final step to ports by rail to avoid city traffic congestion. Although the topic is most obvious in Auckland, Napier is looking at an inland port to avoid the need for trucks to go through the centre of the city to the port.

Conclusion

- The overwhelming conclusion from the case studies is that rail generally does not offer a commercially attractive alternative to road transport and in one case absolutely no service at all. Companies accept that rail freight rates are very competitive, but the lack of service and reliability make rail an unattractive transport solution for all but a small proportion of freight requirements.
- The case studies suggest that almost no matter how big the price differential between road and rail becomes they will still be compelled to use road transport to meet customer requirements of timely and secure deliveries.
- The problem with rail is not its relative cost, but its inability to provide reliable delivery and its relative inflexibility. For an economy that relies on flexibility and responsiveness to overcome a number of other economic disadvantages (lack of scale, remoteness), anything that artificially forces firms to use rail rather than road will compromise business competitiveness.