

TRANSITION TO GROWTH: TRANSPORT AS A SPRINGBOARD FOR ECONOMIC GROWTH

Michael Bealing
Ministry of Transport New Zealand¹

ABSTRACT

Transport infrastructure underpins economic and social activity by providing a framework for interaction in business and social activities. A well-developed transport system, that offers users choice, facilitates growth in the economy by supporting innovations, trade and agglomeration through providing a framework for connectivity on both a domestic and international scale. The state of the transport infrastructure can be either a springboard or stumbling block for economic growth and development in New Zealand. Therefore, the approach to transport investment is important because inappropriate or inadequate investment could constrain the growth and development in New Zealand.

Transport infrastructure will become an increasingly influential factor in urban areas as the population and urban density increases in New Zealand. The challenge is to understand where significant transport enhancements can be made to contribute to creating an environment for short term economic stimulus and long term economic development. This paper explores some of the international thinking and empirical research on the links between transport investment, productivity, economic growth and development based on international and New Zealand based research.

INTRODUCTION

Transport infrastructure can be a springboard for economic development or a stumbling block because it is fundamental to economic activity and influences how an economy grows. Decisions made about transport infrastructure in the present have a lasting impact due to its longevity. The construction phase of many large projects exceeds the length of New Zealand's short election cycle. Therefore, it is important that transport infrastructure decisions are well-informed and made with the long-term impacts in mind.

This paper explores some of the literature on the contribution of transport to economic development and improved productivity. I hope this paper will show that there is no single transport solution for every journey and transport improvements are more about facilitating opportunities for development. The needs of freight are different to the needs of urban commuters. The mix of solutions will influence long-run economic development. The first section briefly introduces the idea that transport is an enabler of economic activity, which underpins the economic geography of New Zealand. The second section focuses on freight transport. The third section covers urban transport, agglomeration and public transport. The fourth section covers transport investment as a form of economic stimulus.

¹ This paper does not necessarily represent the views of the Ministry of Transport

Many thanks to all those who provided information and feedback for this paper.

TRANSPORT AS AN ENABLER OF ECONOMIC ACTIVITY

Transport is an essential part of the economy because it enables the movement of goods and people. Transport services and infrastructure underpin economic activity by providing the linkages for interaction in business and household activities. Transport infrastructure has a primary role in the real economy. Eddington (2006) comments:

“A good transport network is important in sustaining economic success in modern economies. The transport network secures connectivity between different parts of a country, as well as to the rest of the world: linking people to jobs; delivering products to markets; underpinning supply chains and logistics; and supporting domestic and international trade. The quality of infrastructure, and how comprehensive the transport network is, will influence the role transport plays and its contribution to the functioning of a successful economy.”
(Eddington, 2006, p.8)

Eddington (2006) suggests that improvements to transport can impact GDP in three ways. Firstly, transport determines access to labour and material inputs that then determine the cost and production of outputs. This combination of outputs then flows on to determine aggregate GDP. Secondly, transport influences productivity through journey times and transport costs. The level of congestion is a significant factor in the length and reliability of journey times, which then influences firm operating costs and performance levels. Thirdly, public investment in transport infrastructure facilitates private investment and economic activity which leads to a return on investment for private entities and the accumulation of financial capital.

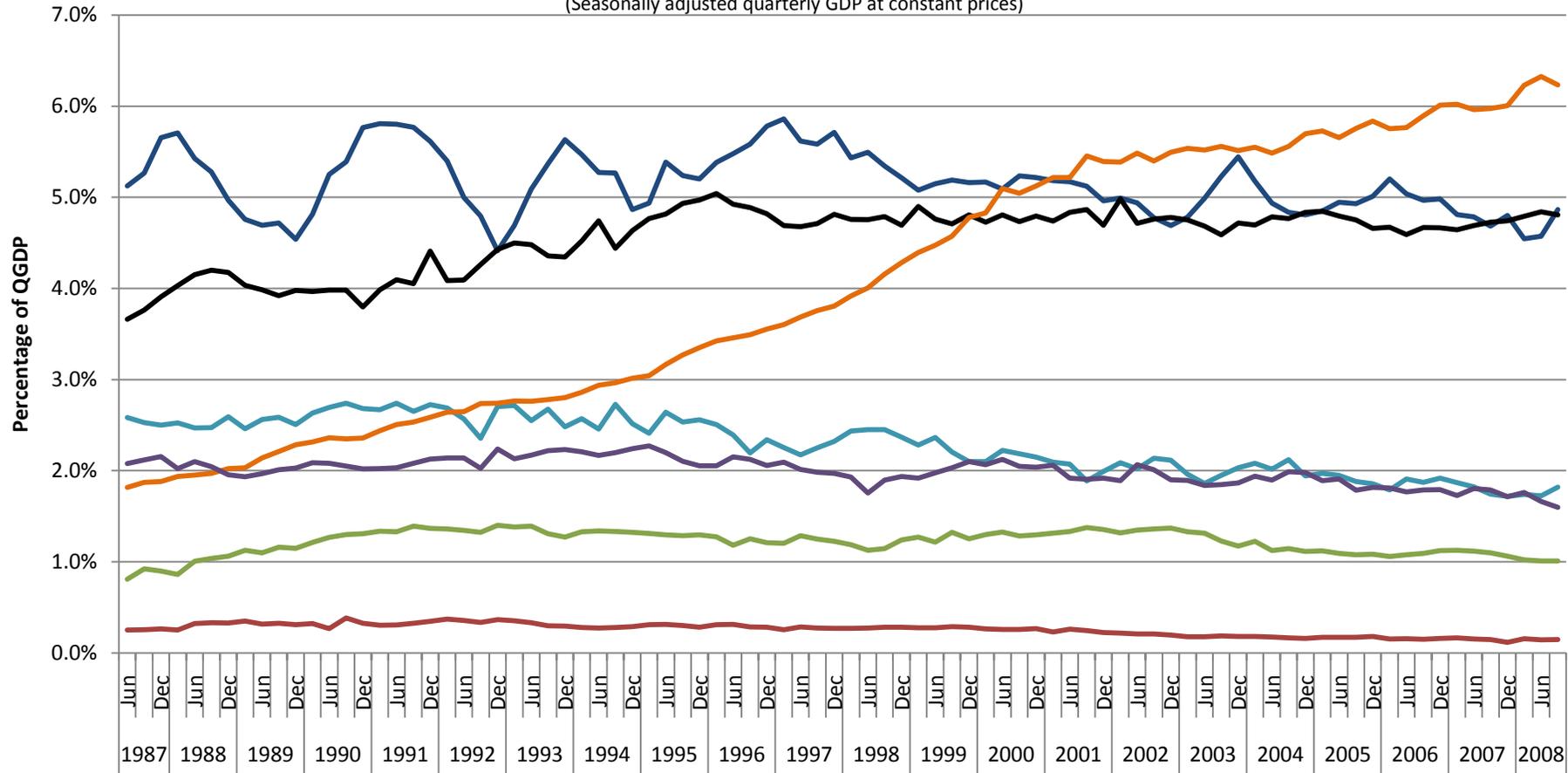
Freight transport costs, including the cost of congestion, are a small but determining factor in New Zealand's economic performance. Based on estimates from Statistics New Zealand, the transport and storage industry has directly contributed about five percent of GDP during the last three decades. Figures 1 and 2 show that the direct contribution of the transport and storage sector has been stable and consistent since 1995. As a share of GDP transport and storage is similar to the direct contribution from agriculture. This estimate is based on the value added from each firm in the industry and covers both freight and people movements.

THIS LITTLE PIGGY GOES TO MARKET – FREIGHT TRANSPORT

Freight transport is fundamental to New Zealand economy. Manufacturing costs and profits are influenced by the cost and reliability of domestic freight transport. Freight provides the physical links in the complex supply chain, which begins with raw inputs that get transformed into intermediate and final outputs. This process can require many transport stages including final delivery to market.

Figure 1: Selected Industries - Contribution of total GDP

(Seasonally adjusted quarterly GDP at constant prices)

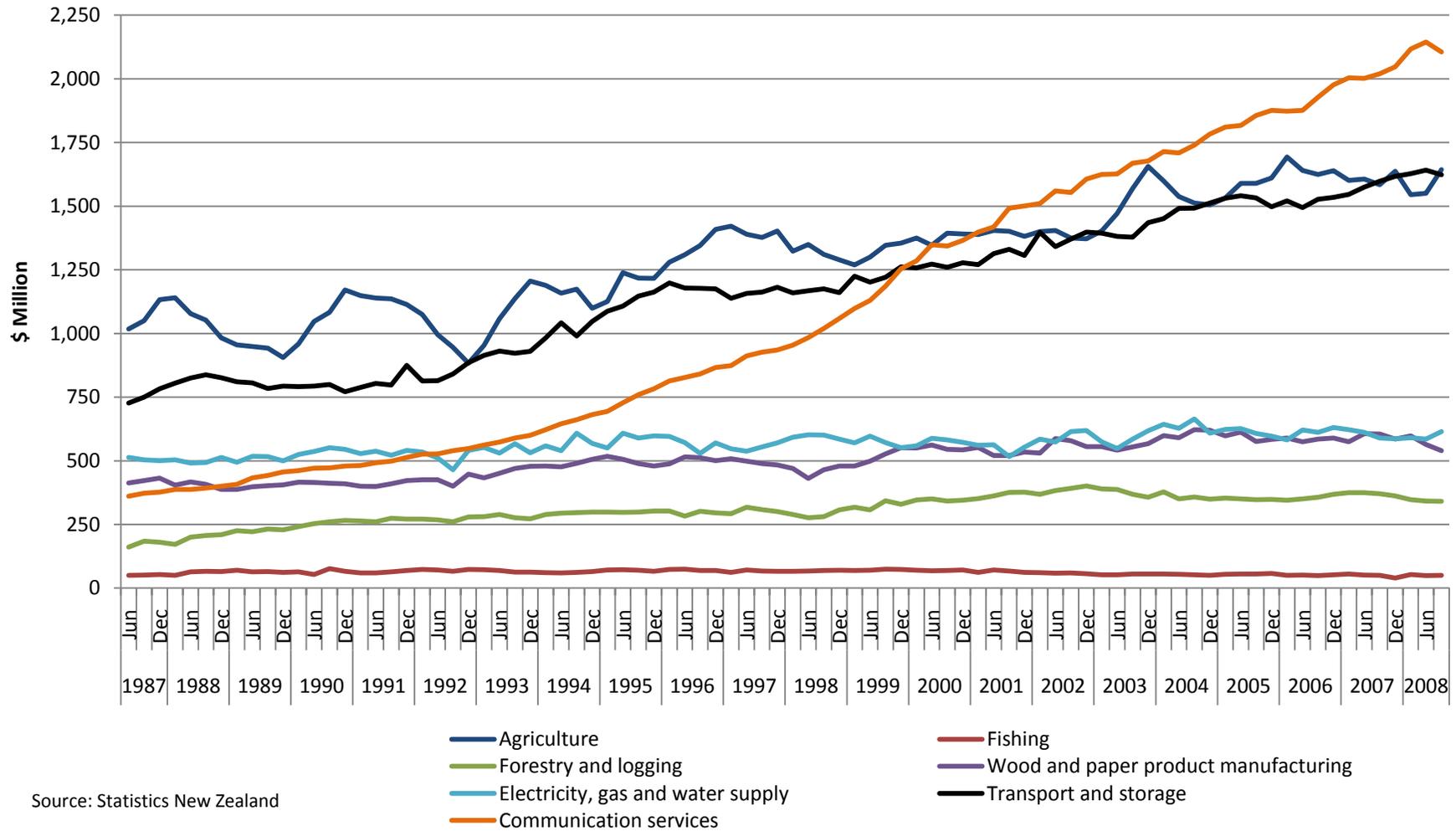


- Agriculture
- Forestry
- Transport & storage
- Wood and paper product manufacturing
- Fish
- Electricity, gas & water supply
- Communication services

Source: Statistics New Zealand

Figure 2: Quarterly GDP of Selected Industries

(Seasonally adjusted at constant prices)



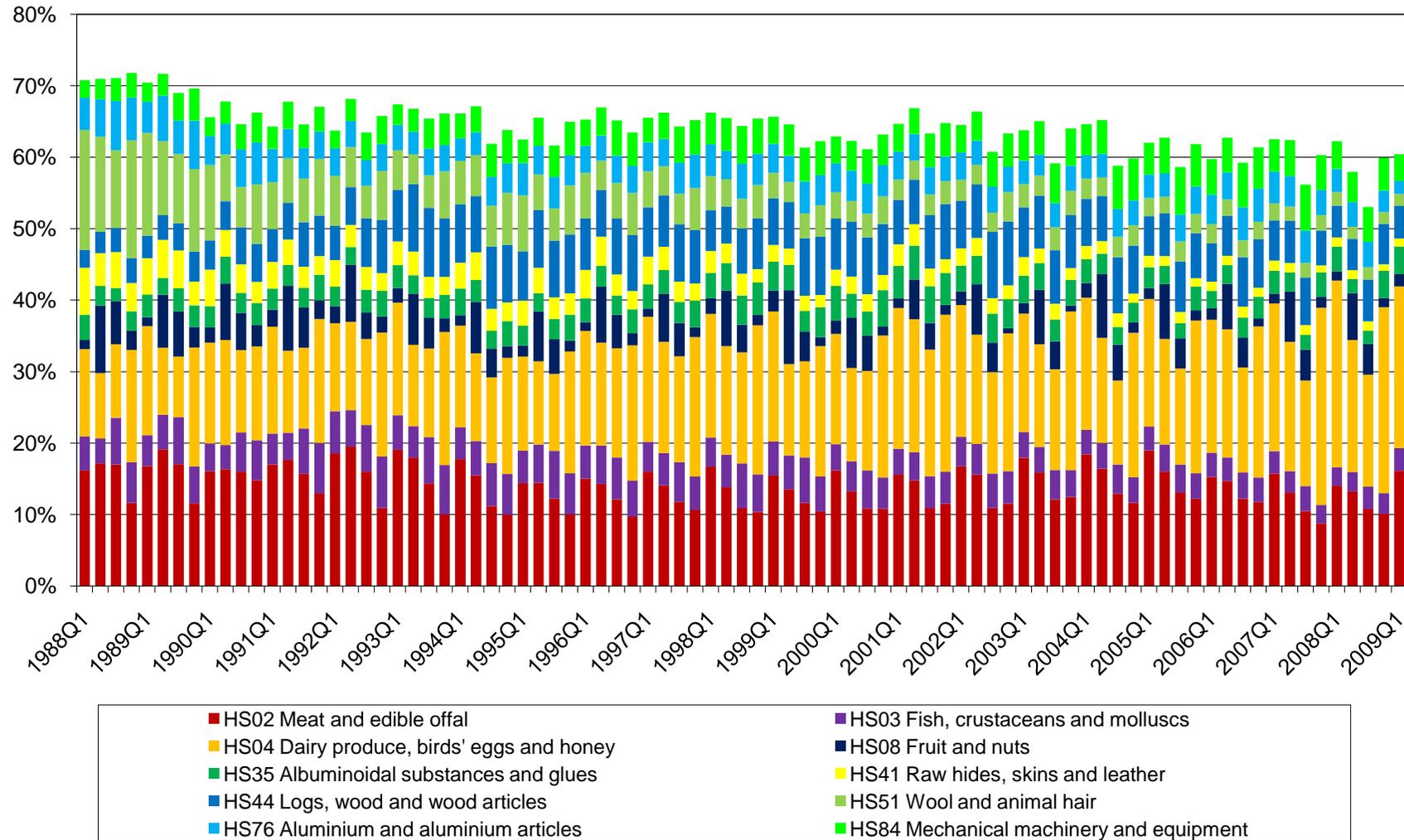
Source: Statistics New Zealand

Transport costs and reliability also influence inventory levels. There is an inverse relationship between transport costs and the amount of stock companies choose to hold on site. Low cost reliable transport allows firms to reduce inventory levels, which increases cash flow and reduces the business risk associated with unsold stock. It also allows firms to reduce onsite storage costs, especially in retail locations where rent cost is high. Decreasing freight costs during the last half of the twentieth century may have contributed to the increasing use of just-in-time delivery of goods. The impact this has had on transport demand in New Zealand has not been quantified, which suggests there is scope for further research in this area. More specifically there is a possibility that increasing use of just-in-time delivery may have resulted in a decline in transport efficiency due to an increased number of trips by smaller delivery vehicles and lower capacity utilisation. However, this hypothesis is untested.

Another way that transport enables economic activity within New Zealand is its crucial role in exporting agricultural commodities. Agricultural production is tied to the location of productive land. In the case of farming, imported inputs such as machinery and fertiliser must be delivered to farms and products for export must be packaged and transported to the appropriate international export gateway. Therefore the cost of transport and the combined result of decisions about transport infrastructure investment over time affect the competitiveness and cost structures of agricultural production. Agricultural exports continue to make a significant contribution to GDP. As illustrated in figure 3, the top ten exports have consistently contributed more than half of New Zealand's export earnings and seven out of ten of these exports are agricultural products. Freight transport cost is a factor in profitability and competitiveness of exports. Given the consistent contribution of agricultural exports over the period 1988 to 2008, it is reasonable to say that New Zealand will continue to export these goods for some time. So any reduction in the cost of transport is likely to support the competitiveness and profitability of these industries. As evident from the white space in figure three, other commodities may be becoming increasingly important. Therefore, one area of future research will be to investigate whether these other commodities have any unique implications to freight transport and transport infrastructure.

The geographic dispersion of agricultural production implies that roads and road vehicles will continue to play a major part in farm business due to the great flexibility of road transport. Rail and coastal shipping can also play a part. The Government is now the administrator of road and rail investment in New Zealand. However, the interaction criteria for making investment decisions between road and rail infrastructure investment, has yet to be determined. In my view, this is probably one of the most important transport issues of current times. Surely, the great advantage of state administration of rail and road transport is that decisions about infrastructure investment could potentially be coordinated across rail and road to reduce the costs and maximise benefits to transport users.

Figure 3: Top Ten Exports by Value



In a recent study of 21 OECD countries, Boulhol et al. (2008) suggested that New Zealand's and Australia's relative geographic isolation from export markets may reduce GDP per capita in both countries by up to 10 percent. For transport the implication is about the need to reduce the cost of long-distance sea freight and improve the utilisation of existing domestic freight routes. The international sea freight industry is undergoing a period of significant rationalisation. The outcome of this global rationalisation is likely to impact on the number of ship visits to regional ports. Broadly speaking the international sea freight industry is moving to a global hub and spoke model. This means the international freight community may force New Zealand to have one or two international sea freight hubs.

URBAN TRANSPORT AND EMPLOYMENT DENSITY

Transport can be a determining factor in urban economic growth. Congestion can also be a stumbling block for economic growth. Congestion associated with some forms of urban transport can be costly for commuters and businesses. The economic development of New Zealand's cities will depend partly on the provision of transport infrastructure and services as the population grows. This section will focus on urban transport issues.

The existence of cities is evidence that there are economic benefits from the spatial concentration of businesses and households. These benefits are commonly referred to as agglomeration benefits. It is proposed that the density of firms leads to productivity spillovers. The benefits of agglomeration are thought to include labour pooling, skill spillovers and technological innovation. However, Krugman (1991) argues that production of manufactured goods will take place close to the main source of market demand to minimise overall costs including transport and access to labour. Therefore transport cost can determine the spatial location of labour and production through its influence on effective distance. This means transport is a defining factor in agglomeration.

Urban transport and urban planning have a role in determining the extent to which cities experience positive benefits of agglomeration and/or negative impact of congestion. Improvements in transport infrastructure contribute to the realisation of agglomeration benefits through enabling increased access to markets and reducing the effective geographic separation between inter-related businesses, which contributes to productivity gains from specialisation and aids innovation from knowledge spillovers. A recent OECD symposium (ITF, 2008) acknowledged the value of wider economic benefits (such as agglomeration externalities) in project appraisal. However, they concluded that the current level of understanding is insufficient and the use of simplistic rules as a proxy could result in undesirable outcomes.

Research undertaken in New Zealand regarding the link between employment density and productivity found mixed results. If agglomeration benefits can be realised in New Zealand then Auckland is the most likely location for them to occur. Abusah and de Bruyn (2007) suggested that the limitations of transport in Auckland are constraining the city from achieving agglomeration benefits, compared to benefits experienced in cities of similar size. Grimes (2007) found that Auckland had

a lower average travel speed than any of the Australian state capitals and Wellington. This means that a comparable distance would take longer to travel in Auckland.

A higher population density will lead to greater congestion if the demand for transport is not managed well. While improvements to the road network and public transport network in Auckland have been made in recent years, congestion remains an issue in the city. The level of public transport provision in Wellington compared with Auckland may contribute to ensuring a much more manageable commuter peak in Wellington than in Auckland. According to Statistics NZ: "Approximately 25 percent of commuters to Wellington's four cities used public transport, compared with 4 percent of commuters to the Auckland metropolis from surrounding districts." Statistics NZ (2009, p.1) Statistics NZ also found that: "People who travelled to work in the four cities of Wellington had lower use of motor cars, with only half taking a private car, truck, or van, compared with almost two thirds of people who worked in the Auckland metropolis." (Statistics NZ, 2009, p.6) This suggests there is a need for a broader approach to congestion management in New Zealand's largest cities. There are alternatives to the expansion of road capacity. Especially considering the greater capacity may be not be utilised outside of peak commuter periods.

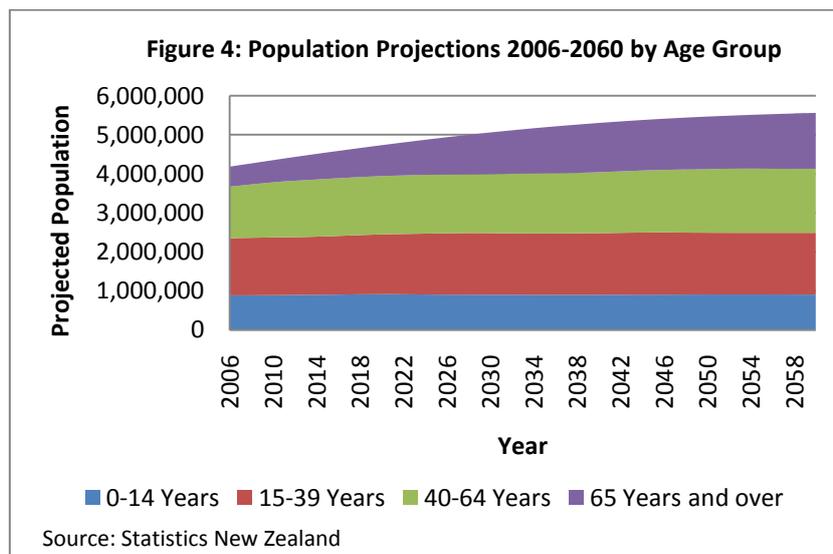
Vickerman (2008) writes: "Whilst recent work does suggest that there are stronger effects from denser development close to transit developments implying that joint planning of transit and land use may be a more effective way of capitalising on the development, once again it would be wrong to conclude that all such development will produce similar positive results. Frequently this will depend on the extent to which it is the absence of good transportation links, by any mode, is the constraint on economic development. If transportation is not the constraint then no amount of additional investment is likely to create economic benefit."

Sankaran et al (2005) stated that "road traffic congestion in the Auckland region is considered a national problem: in terms of lost income, time and pollution, congestion is estimated to cost the NZ economy nearly NZ\$1 billion per year – about one percent of New Zealand's GDP". On this basis the current transport system is a constraint in Auckland. Congestion imposes costs in time and resources that could be utilised elsewhere to add to regional GDP. It is clear that congestion related delays have a negative impact on productivity, fuel efficiency and the living standard of people in Auckland. Further investigation into the potential for more public transport, walking and cycling usage in Auckland is warranted.

A growing population will place increasing demands on the transport network. The population is likely to become increasingly urbanised and therefore require efficient forms of urban transport and urban land use planning to ensure productivity can be maintained and improved. Based on estimates by Statistics New Zealand the population is projected to be 5.3 million by 2040 and 5.6 million by 2060. The population is expected to reach 5 million around 2030. A growing population is expected to increase demand for public and private transport. The age distribution of New Zealand will shift towards an older population, as shown in Figure 4. The cohort between 0-14 years of age will remain relatively stable at around 900,000 people. However, the population over 14 years of age is projected to grow by around 33 percent by 2040. This will increase demand for transport and mobility. The increase

in this cohort represents an increase in the number of potential drivers. This must be managed to avoid a similar increase in single occupancy vehicles and further congestion on roads.

In line with expected demographic shifts in other OECD countries the proportion of population over 65 years of age in New Zealand is projected to grow significantly. The proportion of the population over 65 years old is expected to increase from 12 to 23 percent by 2040. Projections suggest the number of people 65 years and older will double by 2040, reaching 1.3 million people. This could change the relative demand for different types of transport. An ageing population also has cost implications for the recently introduced SuperGold card. This initiative will contribute to ensuring the mobility of the population over 65 years of age.



TRANSPORT INVESTMENT AS A FORM OF ECONOMIC STIMULUS

Since early 2009 governments in the OCED have been actively looking to use transport infrastructure investment to stimulate the economy and increase productivity. Klaus Schmidt-Hebbel, Chief Economist at the OECD advises caution because the full benefits of a transport infrastructure project aimed support a recovery will take a long time to be fully experienced. This infrastructure investment is durable because the final result is physical infrastructure, so it is vital to choose the right infrastructure option to achieve the maximum long-term benefits. Any additional transport investment as part of an economic stimulus package occurs in the context of existing transport investment programmes. The degree of economic benefits will depend on the nature of historic of investment. Transport infrastructure investment can also support recovery through it positive impact on business confidence.

Evidence suggests the greatest long-term benefits from transport infrastructure occur in the presence of a deficit of investment or in the construction of primary connections (where no previous transport link exists). The primary purpose of transport infrastructure is to connect firms and communities. New connections can

stimulate growth and productivity. Fernald (1999) investigated the link between state highway construction and productivity in the United States using data from 1953-1989. The empirical results suggested that primary network construction lead to significant productivity gains, especially in vehicle intensive industries. However, the construction of additional capacity or secondary networks leads to much lower improvements in productivity, due to diminishing returns to scale. This result implies that the greatest long-term gains from transport infrastructure investment occur as a result of the construction of primary links.

In a similar review of the economic benefits of road infrastructure developments in North Wales, Bryan (1998) found that the benefits to the local economy were modest in comparison with the high construction and upheaval costs. The study concluded that new road construction is only one piece in the economic growth puzzle and must be supported by measures to attract new businesses to the area.

Chandra and Thompson (2000) found that highway construction in the U.S. benefited some industries by reducing the transport costs, but the overall impact on business was ambiguous. The authors found that rural areas adjacent to new highways benefited from increased activity. However this new activity may have been siphoned from others areas which the net benefit of new highway construction may be less than expected when spatial reallocation of economic activity is accounted for.

A comparison of road transport investment in New Zealand, Ireland and Norway was recently undertaken (Hay, 2008). In terms of road transport networks and population size Ireland and Norway are similar to New Zealand. The available data allowed a comparison for road construction, operation and maintenance. As a percentage of GDP the investment in roads was similar in the three countries in recent years. This suggests that the investment in road infrastructure in New Zealand has been in line with investment in similar countries in the OECD. This comparative study was limited to road infrastructure investment in each of the three countries. Further work is required to compare the investment in rail and public transport.

In a much discussed paper, Aschauer (1989) estimated that the elasticity of output with respect to the level of public infrastructure capital in the United States between 1949 and 1985. Aschauer suggested an elasticity ranging between 0.38 and 0.56, which implies that a 10 percent increase in public infrastructure capital will lead to an increase in output between 3.8 and 5.6 percent respectively. This is a large result. Subsequent work cast some doubt of the econometrics applied here, but Aschauer's original work led to further investigation by others. In a more recent study of 22 OECD countries Kamps (2004) estimated the elasticity of output with respect to public capital stocks for the period from 1960 to 2001. For the panel of 22 countries Kamps estimated an elasticity of 0.22, which was statistically significant at the 5 percent level. The country level estimate for New Zealand was not statistically significant at 5 percent level. This may be due to the notable decline in real capital formation for New Zealand in the data used by Kamps.

Nadiri and Mamuneas (1994) found that investment in public infrastructure capital had a positive effect on the costs and productivity of private sector industries, but the effect was much less than those proposed by Aschauer (1989). For most of the

industries investigated by Nadiri and Mamuneas the cost elasticity with respect to an increase in public infrastructure ranged between -0.1 and -0.15, with the exception of petroleum and refining related industries (-0.21) Nadiri and Mamuneas (1994) also found evidence that investment in public infrastructure capital leads to marginal social benefits that exceed marginal social costs.

Shirley and Winston (2004) investigated the impact of highway infrastructure investment in the U.S. on firm inventories during the period between 1980 and 1996. Their aim was to investigate the link between highway spending and increases in productivity by improving the cost, speed and reliability. Their results suggest the benefits from highway spending to firms were small and decreasing. The impact of deregulation was much stronger. Shirley and Watson concluded that "In sum, it appears that large investments on a mature highway system during the 1980s and 1990s may have had only a small positive impact on firms' logistics costs and generated low returns because they were, in part, undermined by suboptimal policies." (Shirley and Watson, 2004, p.413).

It is important to distinguish benefits from innovations in transport technology and the provision of transport infrastructure. Historically utilisation of canal and railway technology contributed to increases in productivity in the United Kingdom. Crafts and Leunig (2005), in their background paper to the Eddington Transport Study (2006), suggested "On occasions, technological progress in transport has led to an appreciable acceleration in the growth rate, for example, in the nineteenth century age of steam, while in other cases economic growth has surged quite independently of any significant contribution from transport, for example, in Ireland in the recent past." (Crafts and Leunig, 2005, p.51)

The effect of the introduction of new transport technology is similar to the original development of a primary network connection. It increases connectivity and lowers costs, which allows resources to be utilised elsewhere. This implies that opportunities for growth and development may also come from new innovations, beyond existing technology. This could be an untapped area for New Zealand. One key advantage of New Zealand's geographic isolation, compared to countries in the European Union, is that there is no requirement for ensuring compatibility with external road networks. Domestic transport has scope for innovation, as long as New Zealand maintains its international gateways.

CONCLUSION

The contribution of transport to economic performance is broad and complex. It is almost impossible to measure and encompass the entire value of the contribution of transport to economic performance, productivity and ongoing development. The research reviewed in this paper suggests that investment in primary connections, where no previous connection existed, yield the greatest return and subsequent investment experiences diminishing returns. Governments around the world have sought to use investment in transport infrastructure as a lever for creating economic stimulus. Investment in public infrastructure can support economic recovery in the short run through positive impact on expectations but the full benefits will take longer to be experienced. Transport infrastructure is lasting so the extent of the benefits will depend on making appropriate decisions when picking which projects to invest in.

There continues to be a need to balance provision for needs and choices of the spectrum of transport users against budget constraints.

The majority of New Zealand's export commodities, by value, are agricultural products that are tied to the location of productive farm land. This implies that the profitability and competitiveness of our exports are influenced by transport cost. International transport costs are determined by the global market. However, domestic freight costs are partially determined by the mix of transport infrastructure investment.

Urban transport infrastructure and transport services have a fundamental role facilitating increasing returns to scale and agglomeration benefits that can be experienced in major areas. Research on transport and agglomeration in New Zealand's largest urban area suggest that the current mix of transport choices is not quite right yet and there is scope for improvement in the provision of alternatives to private vehicles during peak commuter periods.

Transport needs are as diverse as transport users. The mix of transport infrastructure and services will influence New Zealand's long term economic growth and development. The acquisition of rail infrastructure presents a great opportunity of coordinate infrastructure investment across rail and road to reduce cost and increase benefits. Further work is required to determine the strategic transport priorities that will shape the economic development of New Zealand and improve productivity in the long term.

REFERENCE LIST

- Abusah, S. & de Bruyn, C. (2007) *“Getting Auckland on track: Public Transport and New Zealand’s Economic Transformation.”* Ministry of Economic Development, working paper, August 2007.
- Aschauer, D.A., (1989), “Is public expenditure productive?” *Journal of Economic Literature*, Vol. 23, No .2, pp.177-200.
- Boulhol, A et al (2008). *“The contribution of economic geography to GDP per capita.”* OECD Economics Department working Paper No. 602.
- Bryan, J. et al (1997). *“Road infrastructure and economic development in the periphery: the case of the A55 improvements in North Wales.”* *Journal of Transport Geography*, 5(4) p. 227-237.
- Graham, D., Centre for Transport Studies, Imperial College, London. *“Investigating the link between productivity and agglomeration for UK industries”*
<http://www.dft.gov.uk/pgr/economics/rdg/webia/webtheory/stigatingthelinkbetweenp1077.pdf>
- Chandra, A. and Thompson, E., (2000). “Does public infrastructure affect economic activity? Evidence from the rural interstate highway system.” *Regional Science and Urban Economics*, 30:3, pp. 457-490.
- Crafts, N. and Leunig, T. (2005). “The historical significance of transport for economic growth and productivity.” London School of Economics.
- Eddington, R. (2006). “The Eddington Transport Study – Main Report: Transport’s role in sustaining the UK’s productivity and competitiveness.”
<http://www.dft.gov.uk/about/strategy/transportstrategy/eddingtonstudy/>
- Fernald, J.G. (1999). *“Roads to prosperity? Assessing the link between public capital and productivity.”* *American Economic Review*, Vol. 8(3), pp. 619-638.
- Grimes, A. (2007), *“Transformative Transport: Transport and Economic Transformation.”* Conference paper presented at Transport – The Next 50 Years conference, Christchurch, N.Z., July 2007.
- Hay, N. (2008) *“International comparison of road infrastructure investment.”* Presented at Australasian Transport Research Forum, 30 September – 3 October 2008. Queensland, Australia
- Hirschman, A.O., (1958) *The Strategy of Economic Development*, New Haven, Yale University Press.
- International Transport Forum (2008) *“The Wider Economic Benefits of Transport.”* OECD/ITF, Transport Research Centre, Round Table 140.

Krugman, P. (1991). "Increasing returns and economic geography." *Journal of Political Economy*, Vol.99, No.3, pp. 483-499.

Nadiri, M.I., and Mamuneas, T.P., (1994) "The effects of public infrastructure and R&D capital on the cost structure and performance of US Manufacturing Industries." *Review of Statistics and Economics*, Vol. 76:1.

New Zealand Government (2008) "*New Zealand Transport Strategy 2008*"

OECD (2008) "*Transport Infrastructure Investment: Options for Efficiency.*" Transport Research Centre, International Transport Forum, OECD.

OECD (2008) "Economic Outlook" Vol. 2008, No. 2.

Sankaran, J, Gore, A and Coldwell, B (2005). "The impact of road traffic congestion on supply chains: insights from Auckland, New Zealand". *International Journal of Logistics: Research and Applications*, Vol. 8, No. 2, June 2005, pp. 159–180.

Shirley, C. and Winston, C., (2004) "Firm inventory behaviour and the returns from highway infrastructure investments." *Journal of Urban Economics*, Vol. 55, pp. 398-415.

Statistics New Zealand, (2009). "Car, bus, bike or train: What were the main means of travel to work?"

<http://www.stats.govt.nz/publications/populationstatistics/commuting-patterns-in-nz-1996-2006.aspx>, Accessed 26 August 2009 4:59pm

Vickerman, R. (2008) "Transit investment and economic development. *Research in Transportation Economics*, Vol. 23, No. 1, pp. 105-117.