Economic Linkages between New Zealand Cities: Final Report

May 2011

Richard Paling, Kel Sanderson and John Williamson

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Report by Ascari Partners Ltd,
Richard Paling Consulting
Business and Economic Research Ltd (BERL)

Ascari Partners Ltd
PO Box 5345
Wellesley Street
Auckland

Phone +64 9 358-0069

Fax +64 9 358-0066

Authors John Williamson,
Kel Sanderson
Richard Paling

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Table of Contents

Abbreviations

AHT – Auckland, Hamilton and Tauranga

BoP - Bay of Plenty

EEM - Economic evaluation manual

EGA - Economic Growth Agenda

FTEs - Full Time Equivalents

GDP - Gross domestic product

MOT - Ministry of Transport

MUL - Metropolitan Urban Limit

NZTA - New Zealand Transport Agency

TLAs - Territorial Local Authorities

1 Executive Summary

1.1 Background

Cities and city-systems are now the drivers of economic growth and in other countries strong interconnections between neighbouring cities have been found to be important contributors to economic development. However there has been little economic analysis of these interconnections undertaken in a New Zealand context to date.

The economic dominance and continued high rates of economic and population growth being experienced by Auckland,[1] Hamilton and Tauranga provides a strong rationale for the investigation of the economic linkages between these three cities.[2] Accordingly, the purpose of this research project has been to test for the emergence of a 'city system' between the Auckland, Hamilton and Tauranga (AHT) city-regions. In doing this the research:

- identifies the main economic connections between the AHT city-regions,
- assesses the impact of growth of the AHT city system on the city-regions within it and the wider New Zealand economy and
- proposes a range of actions to assist in lifting the productivity of the AHT city-system.

This Executive Summary firstly presents the key findings and proposed policy directions and then summarises the analysis which lies behind these findings. The full analysis is set out in the Main Report.

1.2 Identifying the presence of a city-system

For the purpose of this analysis, we have defined a 'city-system' as:

> *"the sites of dense masses of interrelated economic activities that also typically have high levels of productivity by reason of their jointly-generated agglomeration economies and their innovative potentials."*[3]

[1] Where reference is made to 'Auckland' or 'Auckland Metro', this is defined as the area covered by four former cities of North Shore, Auckland, Waitakere and Manukau. This area is within the boundaries of the Auckland Council. Where reference is made to the 'Auckland Region' this is based on the region's boundaries prior to the formation of the Auckland Council in 2010. It is therefore equivalent to the area covered by the four cities plus Rodney, Papakura and the portion of Franklin included within the old Auckland region.

[2] The three cities accounted for 37 per cent of New Zealand's employees and 38 per cent of GDP in 2009.

[3] Scott, A.J. and Storper, M., 2003, 'Regions, Globalization, Development', *Regional Studies,* Vol. 37: 6&7, Pp 579-593. p7.

Our analysis sets out to understand whether the proximity of the three cities has led to higher than expected levels of economic integration, via, labour markets, flows of goods and services and knowledge exchange and whether this has contributed to economic growth.

1.2.1 Movements of people

The results of our analysis indicate that from a labour market perspective Auckland, Hamilton and Tauranga actually possess relatively insular economies, with a very low level of commuting between the three cities. This is also consistent with patterns observed for business travel between the three cities, which are also low and indicate relatively little face-to-face business activity taking place between the three cities. The results of the interviews we undertook for the study reflect this picture. For example, one major business service provider informed us that although staff located at their Hamilton or Tauranga offices did work from time to time in the other city this would involve the employee staying overnight rather than commuting if it was for more than one day.

For both commuting and business travel, the low flows are at least in part a reflection of the considerable travel times and distances between the three cities, further questioning the emergence of an effective city-system.

In addition to commuting, labour mobility into or within the AHT region could in principle be facilitated via migration between the three cities. However our analysis suggests that this is relatively small, compared to inward migration from the rest of New Zealand (for Hamilton and Tauranga) or from overseas (for Auckland).

1.3 Movements of goods

From a freight perspective, important linkages do exist between the three regions in which the AHT cities are situated, with high freight flows between Auckland and Waikato and between Waikato and Bay of Plenty. However, in volume terms these movements are dominated by basic commodities which are typically generated away from the cities. For many of these commodities access to a port, either in Auckland or Tauranga is very important and hence good freight connections support primary economic activity in rural areas.

For the higher value commodities typically generated or consumed in the cities, Auckland is a major market and is also the key distribution centre for the country. The flows generated include:

- Goods to supply the large markets in Auckland, either from domestic sources or from overseas, where the links provided by the Ports of Auckland and of Tauranga and Auckland Airport play an important role,
- Exports from Auckland, and
- Distribution from Auckland to other parts of the country.

The size of the three cities also creates demands for the movements of commodities to support both personal and commercial activity within the cities and these demands are likely to increase as populations and employment grow strongly over the future.

1.3.1 Firm linkages

To complement the analysis of people and freight movements we also examined firm linkages within the region. As part of this we investigated whether the scale of Auckland acts to reduce the size of some industries in Hamilton or Tauranga. We found that while Hamilton and Tauranga have a smaller share of employment in business services, their levels are similar to other provincial cities rather than being substantially serviced by Auckland. There is evidence of Auckland's specialisation within the specific area of finance and insurance, however, Wellington exhibited even stronger specialisation. Tauranga's independence from Auckland is exhibited in the gravitation of some finance services from Tauranga to Auckland but also an increase in Tauranga of some particular business services.

Interview responses confirmed that both Tauranga and Hamilton are well provided locally with respect to most day-to-day business service activities with only the more specialised business services tending to be sourced regularly from other cities including, but not limited to Auckland.

Primary processing industries undertaking the initial transformation of base raw produce (e.g. dairy factories) are almost invariably located outside of cities. It is the more complex transformation of primary produce that takes place in urban areas, notably Auckland. However, there is little evidence of significant flows of input materials from Hamilton or Tauranga into Auckland for further processing.

The analysis of firm linkages supports the view that the three cities appear to operate as relatively independent economies and do not appear to exhibit any great difference in the patterns of firm linkages than would be expected between provincial cities and Auckland.

1.3.2 Economic structure

A key observation is that the three cities display fundamentally different economic foundations and that the economic prosperity of the three cities is strongly influenced by these foundations. Auckland dominates in the business services and financial sectors, providing high level services to the other areas and as discussed above dominates in the distribution sector supplying a range of goods and value added services to the other two cities. However, the linkages in the reverse direction, other than those concerned with the movement of freight are relatively weak.

For the other two cities, their economic structure is strongly influenced by their regional roles. Like most New Zealand provincial cities, the most important factor in Hamilton's initial growth was its role as a service centre for the surrounding rural area, in this case the Waikato with a strong dairy industry. Subsequently Hamilton has been able to use this strong economic base to develop expanded opportunities for example, through the generalisation of agri-science and advanced engineering activity into new markets. Metals manufacturing activity in Hamilton is now serving both the national and

international market having developed from a support activity servicing dairying and milk production. There is now a strong interaction between the agricultural sector in Hamilton and research and development of advanced equipment to support the dairy industry or of processes to increase the efficiency of dairy farming.

In contrast, the underlying economic foundations for Tauranga are weaker, in part caused by the relative remoteness of the city from other major areas of economic activity and in part by the limited opportunities for larger scale value added activities linked with production in the city or its rural hinterland. Tauranga's most obvious recent economic advantage has been its attractiveness as a lifestyle location. Maintaining high levels of amenity in the face of rapid population growth will be a key challenge. While it is likely that there is an important role for Tauranga as a service centre and possibly local manufacturing centre for the Bay of Plenty, this is likely to be more significant in a regional rather than a national context.

1.3.3 The presence of a city-system?

Rather than revealing the emergence of a city-system encapsulating Auckland, Hamilton and Tauranga, we actually find that Auckland's scale is paramount. The central tenets of economic geography strongly suggest that increasing Auckland's scale will be economically beneficial, as will reducing Auckland's isolation from the broader Australasian economic region and encouraging its economic diversification.

Therefore, an important question for us to consider is whether the growth of Hamilton and Tauranga will contribute positively towards increasing Auckland's economic scale, diversity and connectivity to other economic regions of Australasia or whether growth in these cities which occurs at the expense of Auckland would lead to a lower level of economic output?

A main conclusion is that from a labour market and employment structure perspective, inter-relationships between the three cities are relatively weak. More broadly, while economic activity in Auckland plays an important part in supporting the economies of Hamilton and Tauranga, the linkages in the opposite direction are limited.

Looking to the future the potential effects of a range of alternative future growth scenarios for the three cities were evaluated. A part of the analysis of these scenarios highlights responses to differences in the growth of employment, and in particular balances of employment within and between the three cities. The results indicate that higher levels of productivity and output for the region as a whole would be achieved by concentrating employment in the central areas of Auckland rather than by spreading this more widely across the region or switching this to Hamilton or Tauranga.

The impacts on economic development of changes in the level of inter-urban and intra-urban accessibility have also been assessed. While the scale of the forecast response is relatively small in relation to employment changes, these tests indicate the importance of improving accessibility within the urban areas, where an increasing level of economic activity is likely to be located.

We do not find a strong case for the emergence of a city-system between the three city-regions and our analysis indicates that a policy intended to maximise the benefits of

agglomeration would be better served by encouraging the growth of Auckland, rather than encouraging the spreading of activity more widely across the three cities.

1.3.4 Transport context

Putting this into a transport context, the continued growth within the three cities of population, employment, trade in goods and services and social activities will inevitably place increasing pressure on transport systems, both within and between the cities. However, most of these additional trips can be expected to take place within each city.

Importantly, our analysis also indicates that relieving urban accessibility constraints will be most likely to support productivity growth:

- Firstly, due of the relatively self-contained nature of the three economies.
- Secondly, because the most productive activities tend to undertaken in areas of high employment density and rely heavily on good accessibility for workers.
- Thirdly, as inter-regional road trips tend to start and/or finish within urban areas and it is the portion of the trip which takes within the urban area which is most susceptible to the effects of congestion.

1.4 Policy Implications for the AHT Cities

In our view, the main policy implications arising from this analysis are:

1.4.1 Support focussed economic development in Auckland

Our analysis strongly suggests that initiatives which support the increased scale, economic diversity and reduced isolation (internationally) of Auckland will be likely to lead to the highest levels of economic output, both for the study area and for the country as a whole, when compared with initiatives which actively attract growth and economic activity away from Auckland.

Examination of alternative growth scenarios for the AHT region confirms that in particular, increases in employment focussed in the centre of Auckland will have the potential to lead to a greater increases in output than the spreading of jobs either across the Auckland Region (as for example might be the outcome of a relaxation of the Metropolitan Urban Limits) or across the other two cities of Hamilton and Tauranga.

1.4.2 Support Hamilton and Tauranga as regional service centres

Although we have stressed the primacy of Auckland in the AHT region, Hamilton and Tauranga serve important roles as regional service centres. Hamilton is clearly better established in this role and also demonstrates a capacity to leverage off the provision of services to the dairy sector and expand into new sectors and markets, both domestically and internationally. Tauranga is much more a developing regional service centre, reflecting the more recent expansion of horticulture in the Bay of Plenty.

Measures to concentrate regional employment in these centres will provide a stronger economic base within the regions and the potential to generate a wider set of value added activities to support local activities. This will also support the increasing national role of specific activities within these centres, such as agri-science and metals manufacturing in Hamilton. Encouraging accessibility within these two cities would help to support this in initiative. Improved connections with Auckland could allow better interactions and knowledge sharing with the higher-level service activities in Auckland and so help to support economic efficiency in the smaller centres. Improved broadband access might be one part of this in initiative.

1.4.3 Improve accessibility within the cities

Whatever future employment scenario eventuates, the three cities all have the potential to make an increasing contribution to the economic output of New Zealand through their increasing involvement in value added activities. The achievement of this, however, requires that the cities are able to develop efficiently and support areas of high density employment where the benefits of agglomeration can be achieved. This in turn requires that these places of work are accessible to a wide range of workers allowing a good match to be achieved between the skills available in the labour force and those required. By firms

Transport links that provide improved accessibility within the cities, without detracting from urban amenity, will be critical and as the results of the modelling show, improving intra-urban movements generates higher returns, compared with the improvement of inter-urban links. However, this is not surprising. As we have said, the three economies are predominantly insular with most economic activity being associated with local, rather than inter-regional movements.

Importantly, improving internal city links would also help longer distance traffic. For example, about 30 per cent (by distance) of an inter-urban journey between central Hamilton and central Auckland would take place on roading networks within the urban areas of the two cities. It is here one would expect that the highest levels of congestion will be experienced. Therefore, initiatives which improve accessibility within the cities can benefit both local and inter-regional economic activity.

1.4.4 Support and plan for the movements of freight between the three cities within the corridor

While there are substantial freight movements within the Auckland/Waikato/Bay of Plenty regions, many of these are generated in rural areas and so do not form part of inter-city trips. The main exceptions to this are the movements of exported and imported goods between Auckland and Tauranga, much of which travels by container, and the distribution of commodities from the key distribution centres in Auckland. The movement of export and import cargoes involves the use of both road and rail and additional capacity will therefore be needed to accommodate the anticipated increases volume of these. The growth of the cities will give rise to increases in the volumes of goods needed to support the increased levels of commercial and personal activities and capacity both between the cities and within the cities themselves will be required to support this.

1.4.5 Knowledge sharing via education

We found considerable statistical and anecdotal evidence of a relative lack of educational opportunities at the tertiary level in Tauranga. We also observed a number of initiatives between tertiary providers from both Tauranga and Hamilton to address this deficiency. Often this was through the identification of particular niche areas where tertiary education opportunities could be aligned with economic opportunities, such as courses in supply chain logistics, for example. Encouraging more of this type of activity will provide a good mechanism whereby knowledge sharing between the two cities can be fostered and Tauranga can benefit from the relative depth of educational provision available in Hamilton.

1.5 Geographical Characteristics of Study Area

1.5.1 Distance and travel time

An important characteristic of the study area is the distances and travel times between major centres. Even between the closest city pairs the distances and travel times are considerable. This limits the extent of regular interaction. The travel times are also affected by the topography of the study area with the Kaimai Ranges acting as a barrier to movement between Tauranga and the other two cities.

Table 1.1 Travel Times and Distances between the AHT Cities

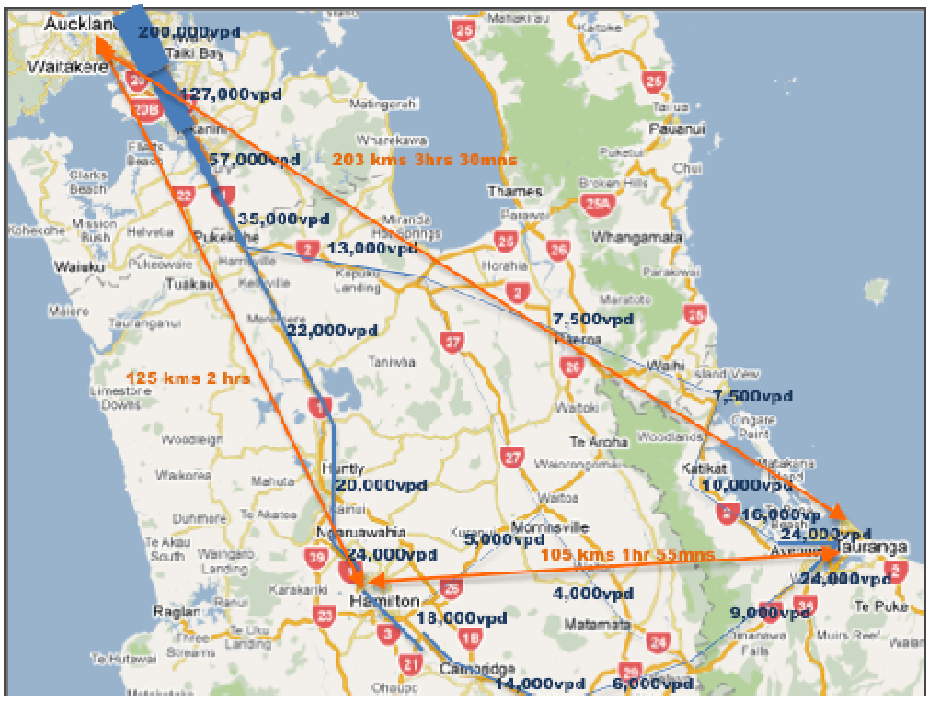
Journey	Distance (kms)	Time (hrs/mins)	
		Slowest	Fastest
Auckland - Hamilton	125	2.00	1.50
Auckland - Tauranga	203	3.30	2.55
Hamilton - Tauranga	107	1.55	1.30

Sources: AANZ, Tourism NZ and Tiki Tours time/distance calculators

Map 1.1: The AHT Region – distances[4] and vehicle flows[5]

[4] These travel times are approximations. They are not intended to reflect the fastest possible trip time between the three cities. It is worth bearing in mind that from a business or commuting perspective these types of trips are most likely to coincide with the times at which the roads are most congested and will therefore be likely to take longer than average, or will require the person making the trip to undertake the journey at a sub-optimal time.

[5] See Appendix 3 for schematic diagram showing distances and traffic flows on all main routes with the study area.



Source: NZTA for vehicle flows

Even relatively close proximity between city-regions does not guarantee any significant degree of economic inter-action. However, in many developed countries the distances between these three cities would be likely to be regarded as quite high. The position is exacerbated in New Zealand because of the absence of rail connections, which typically elsewhere would provide an alternative to roads, operating at high speeds and providing the opportunity to make productive use of the time spent travelling.

1.5.2 Transport links

Roads

SH1 provides the main linkage between Auckland and Hamilton and much of this is in the form of a divided highway, although of differing qualities. Further upgrading of this route is being progressed as the Waikato Expressway one of the Government's Roads of National Significance (RoNS). From Hamilton to Tauranga the main link is SH1 and SH29, which includes a section over the Kaimai Ranges. Part of this route to the immediate east of Hamilton is to be upgraded as part of the Waikato Expressway. There are several routes between Auckland and Tauranga including; SH2 through the Karangahake Gorge through the Kaimai Ranges, or, SH2/SH27/SH29 which joins the route from Hamilton or, SH1/SH29 via Hamilton.

Rail

There are rail links between Auckland Hamilton and Tauranga and these are heavily used by freight traffic, particularly to and from the ports of Auckland and Tauranga. A daily passenger service links Auckland and Hamilton as part of the longer route between Auckland and Wellington and proposals have been made for commuter services between Hamilton and Auckland.

Ports

The area is served by two major international ports, Auckland and Tauranga, which both have rail connections. There are also major inland ports or rail consolidation facilities at Metroport, Southdown and Wiri in Auckland and at Crawford Street in Hamilton, which is used primarily for the storage and consolidation of freight traffic for Fonterra. Hamilton lies approximately equidistant between Auckland and Tauranga.

Airports
Auckland Airport acts as the major international gateway to the region (and to the whole of New Zealand) and is also an important domestic hub. Regional airports exist at Tauranga (domestic flights only) and at Hamilton which has a limited number of international flights. A number of daily flights are operated between Auckland and Tauranga and between Auckland and Hamilton.

1.6 Population and employment characteristics

1.6.1 Population

The three cities are characterised by high growth, with their populations increasing much faster than for the country as whole. Over the period from 1996 to 2009, their total growth of 306,000 amounted to about 57 per cent of that for the country as a whole, with their share increasing from 31 per cent to 34 per cent.

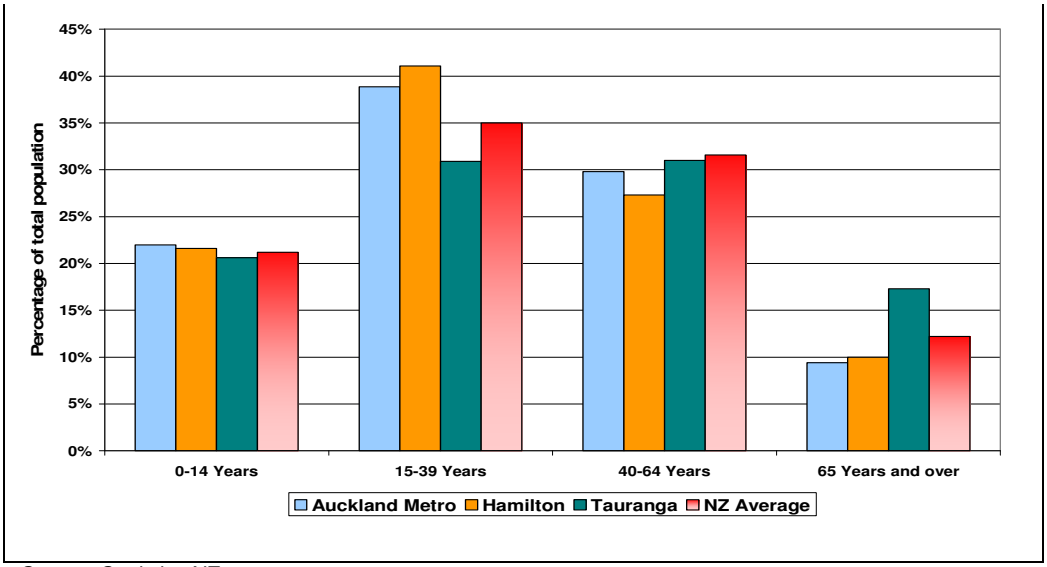
Table 1.2: Population of the AHT Cities, 1996-2009

Area	Population			Average Annual Growth (%)	
	1996	2006	2009	1996 to 2009	2006 to 2009
Auckland Metro	928,000	1,126,000	1,178,000	1.9%	1.5%
Hamilton	110,000	129,000	135,000	1.6%	1.5%
Tauranga	78,000	104,000	109,000	2.6%	1.6%
New Zealand	3,618,000	4,028,000	4,155,000	1.1%	1.0%

Source: BERL, Statistics NZ

Although all the three cities are characterised by high population growth, the characteristics of the population in each are different.

Figure 1.1 Distribution of Resident Population by Age 2006



Source: Statistics NZ

Auckland and Hamilton both have a relatively high proportion of younger people up to 39, whereas in Tauranga there is a much higher proportion of residents in the oldest age group over 65. This has implications for the levels of economic activity in the area with older people tending to have less involvement in the labour force.

1.6.2 Employment

Employment in the AHT cities, particularly the Auckland metro area, is substantial and in 2009 amounted to about 37 per cent of New Zealand's total. As in the case of population, employment in the three cities has increased by a higher rate than for the country as whole. The rate of employment growth to 2006 was particularly strong for Tauranga. Since 2006 the effects of the economic downturn have resulted in a reduction in the rate of employment growth and the percentage increase for the three cities has been somewhat below that of the country as a whole.

Table 1.3: Growth in Employment of the AHT Cities 1996-2009

Employment				**Average annual growth**	
(FTEs)	**1996**	**2006**	**2009**	**1996-2006**	**2006 -09**
Auckland Metro	421,716	555,281	568,776	2.8%	0.8%
Hamilton	49,628	67,740	69,606	3.2%	0.9%
Tauranga	29,578	44,850	46,187	4.3%	1.0%
Total AHT Cities	500,922	667,871	684,569	2.9%	0.8%
New Zealand	1,484,116	1,808,677	1,866,747	2.0%	1.1%
AHT Cities* as proportion of NZ Total	34%	37%	37%		

*Source: BERL, Statistics NZ *(Refers to Auckland Metro area - see footnote page 30 for definition)*

1.6.3 Employment structure

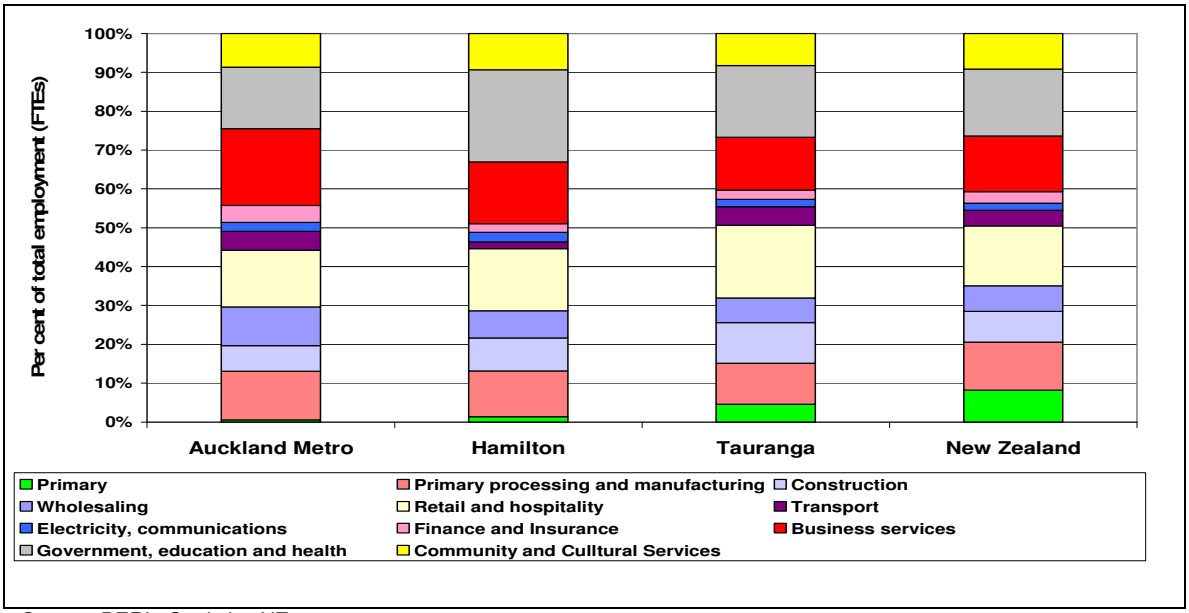
The employment structure of the three cities and in New Zealand as a whole is set out in Figure 1.2. Compared to New Zealand as whole, the three cities have a low share of employment in the primary sector (agriculture, forestry and fishing and mining), as would be expected. Auckland has a particularly high share for business services, finance and insurance, and wholesaling reflecting its position as a key provider of business and financial services both within the city and further afield including Hamilton and Tauranga, where the share is lower. Auckland also has a relatively high share in processing and manufacturing compared to the country as a whole and the other two cities reflecting the size of the potential markets in Auckland and the possible benefits with having activities clustered together.

Hamilton has a relatively high share of employment in Government health and education, due in part to the presence of major educational and medical facilities and to its role as the regional centre for the Waikato.

Tauranga has a relatively high share of employment in the retail and hospitality sector reflecting its position as a tourist destination and regional shopping centre and in construction where there has been considerable activity in both the provision of infrastructure and in development to meet the needs of the growing population.

Compared to other typical provincial economies in New Zealand Hamilton has some significant differences, with relatively high proportions of workers employed in higher value activities. Tauranga, however, displays a similar employment profile to a number of other provincial centres such as Whangarei, Palmerston North and Napier-Hastings.

Figure 1.2 Employment Structure in the AHT Cities 2009



Source: BERL, Statistics NZ

1.7 Existing Linkages

Investigating the linkages between the three cities provides key information to assist in understanding the extent to which they interact and form part of an integrated city region.

Commuting

Given our definition of a city-system, a key area to investigate is the presence of integrated labour markets. To do this we look first at commuting patterns. The data reveals commuting patterns within the major cities in the study area dominated by a high degree of intra-city movements, implying very high levels of self-sufficiency within each city and little integration of labour markets.

Table 1.4: Commuting Patterns in the AHT Region 2006

	Place of work			
Area of residence	**Auckland**	**Hamilton**	**Tauranga**	**Total all defined destinations**
Auckland	441,400	400	150	465,450
Hamilton	550	46,890	100	54,200
Tauranga	350	150	37,550	42,650
All Identified Movements	479,000	61,000	44,000	

Source: Statistics NZ

Only limited numbers of workers come from outside the cities themselves and these typically are from the adjoining districts. The level of longer distance commuting between the three cities is low. The residents of Hamilton and Tauranga contribute only 0.2 per cent to the workforce in Auckland, the residents of Auckland and Tauranga 0.9 per cent to Hamilton, a higher (but still very low) share which reflects its central location and Auckland and Hamilton 0.6 per cent to Tauranga. Although there has typically been growth in the past, these flows remain very low and imply a low degree of interconnectivity.

Migration

Although commuting patterns suggest that integration between labour markets is limited, longer term movements through migration may act to provide linkages between the three cities. Over the period from 2001 to 2006, inward migration has been a significant driver of population growth in Hamilton and Tauranga with about a third of the residents over 15 of each city in 2006 having relocated from outside the city over the preceding 5 years. For Auckland the figure is lower but still substantial at 24 percent.

Table 1.5 Migration Patterns: Auckland Metro, Hamilton and Tauranga 2001-2006 Residents over 15 in 2006

Place of Residence in 2006	**Place of Residence in 2001**					**Total 2006**
	Auckland	**Hamilton**	**Tauranga**	**Other NZ**	**Overseas**	
Auckland Metro	614181	3549	2073	49323	133467	802593
Hamilton	2859	61881	1140	16809	10521	93210
Tauranga	3675	1503	51615	13704	5985	76482

Source: Statistics NZ

However, the data reveals that the single largest source of inward migration for Hamilton and Tauranga is from 'other NZ' locations, outside of the AHT region and for Auckland it is from overseas. In all three cities, therefore, movements from 'other parts of NZ' and overseas are substantially larger than the movements between the three cities. The effects of the economic linkages acting between the three cities through migration are therefore relatively modest.

1.8 Business travel

Although limited, the data on car based business travel to and from Auckland provides a useful indicator of the levels of face-to-face contact associated with business activity between the three cities.

Table 1.6: Daily Business Trips Auckland to External Regions by Road* 2006

Region	TLA (included in regional total)	Total trips	Per cent of daily total
Northland	Total	78	12%
Waikato Region	Hamilton	183	29%
	Waikato District	63	10%
	Other Waikato	116	17%
	Total	362	56%
BOP Region	Tauranga	96	15%
	Rotorua	15	2%
	Other BOP	23	4%
	Total	134	21%
Other		68	11%
Total		642	100%

Source: ARC and Consultant's Analysis *Estimated, excludes truck movements.

The figures indicate that the main destination for business trips from Auckland is the Waikato region and in particular Hamilton, reflecting its location as the largest urban area in the vicinity of Auckland. The number of business trips to Tauranga is about half that to Hamilton, reflecting the smaller size of Tauranga and its increased distance away from Auckland, although for this movement air travel is more important.

While there are issues in comparing the numbers of business and commuting trips, since they are derived from different sources of data, comparing movements between Auckland and Hamilton and Tauranga, business trips are at about 50 per cent of the numbers commuting. For the smaller cities of Whangarei and Rotorua however, the share is much smaller at about 10 per cent of the commuting flows, suggesting a lower level of interaction with the business activities in these centres.

Air travel

Air transport is important in the AHT area both for providing connections to and from Auckland for point to point movements and also for the use of Auckland International Airport as the gateway to a wide number of destinations particularly those served by international flights and this has been growing fairly strongly. Between Tauranga and Hamilton and Auckland business travel by air supplements that identified for land based modes and for Tauranga, based on limited data and estimates of available capacity,

may represent up to 25 per cent of the total business market. However although there is only limited data available, the presence of Auckland as a major international and domestic gateway served from Hamilton and Tauranga by both road as well as internal flights may have a greater impact on economic development than the use of air for point to point movements between Auckland and the other two cities.

Freight

Overall, freight flows between the regions centred on the AHT cities are very substantial, but much of the traffic is related to basic commodities produced in the rural parts of the regions, rather than within the cities themselves. The highest freight flows are between Auckland and Waikato and between Waikato and Bay of Plenty, with the longer distance flows between Auckland and Bay of Plenty being fairly small.

The link between Auckland and Tauranga is important for the Auckland Metro area, but for this, the Port of Tauranga primarily acts as a gateway, and generates relative limited value added activity. Auckland is the key distribution centre for retail and consumer goods and the Port of Tauranga is a source of imported goods to be redistributed by facilities in Auckland.

Courier movements are often a manifestation of higher value interactions between areas with the movements of documents or specialised manufactured products. Within the AHT region, the highest flows of courier traffic are between Auckland and Waikato and between Waikato and Bay of Plenty, with flows between Auckland and Bay of Plenty being relatively small, reflecting the more limited business travel interactions identified above.

However, freight movements in volume terms are dominated by the basic commodities such as aggregate, liquid milk and logs and timber products. These are typically generated in rural areas and may therefore not have any significant direct connection with the higher value added products typically generated by the cities. For the key exported commodities, both ports play a key role in the supply chains between producers and overseas markets. Notably, both ports serve extensive hinterlands outside their own regions. In particular, Waikato with its high production of dairy products and logs is dependent on the ports of Auckland and Tauranga to support these and other export industries, and Tauranga is also an important source of bulk imported materials for the region.

1.9 Firm linkages

To complement the analysis of people and freight movements we examined firm linkages within the region. However, understanding these linkages poses a challenge due to the lack of data. As a way of adding to our understanding we undertook 21 face-to-face interviews with firms and key stakeholders.

We investigated whether the scale of Auckland acts to reduce the size of some industries in Hamilton or Tauranga. Auckland's cluster of business serves local requirements and acts as a national centre for such activity. But, while Hamilton and Tauranga have a smaller share of employment in business services, their levels are similar to other provincial cities rather than being substantially serviced by Auckland.

This tends to support the view we received from interviewees that Hamilton was relatively self-sufficient in the provision of most business services and acted as a service centre for the surrounding region.

Tauranga's independence from Auckland is exhibited in the gravitation of some finance services from Tauranga to Auckland but also an increase in Tauranga of some particular business services and the notable reliance on local business service providers amongst Tauranga's businesses. Interview responses confirmed that both Tauranga and Hamilton are well provided locally with respect to most day-to-day business service activities with only the more specialised business services tending to be sourced regularly from other areas.

There is evidence of Auckland's specialisation within the specific area of finance and insurance. Auckland has a 4 per cent share of employment in this sector whereas Hamilton and Tauranga (and all other cities except Wellington) had just a 2 per cent share. However, Wellington exhibited even stronger specialisation with an 8 per cent share. Interestingly, in one interview with a national financial services provider it was explained how Auckland was critical for generating ideas, innovations and new products within that industry, facilitated through the high concentration of skills and staff turnover between firms within the industry.

In cultural services like arts, sport and recreation the size of this sector in Auckland may be suppressing a little its size in Hamilton and Tauranga. Looked at another way, in a cultural, sport and recreation sense, the AHT triangle appears to some extent to function as a single entity. One of our interviewees noted that one difficulty of attracting new staff to Hamilton was that the city was perceived to be lacking in cultural amenities, however, proximity to Auckland was seen to be an advantage in this respect.

The primary processing industries are some of the most important in New Zealand. Many of the big primary processing plants where initial transformation of base raw produce takes place (e.g. dairy factories) are located outside of cities. It is the more complex transformation of primary produce that takes place in urban areas, notably Auckland. However, there is little evidence of significant flows of input materials from Hamilton and Tauranga into Auckland for further processing.

The findings of the stakeholder interviews add weight to the view that Tauranga and Hamilton are quite self-contained economies. As one respondent noted "Hamilton and Tauranga have few linkages. There is a sense that few firm linkages exist and they are insular economies."

The responses also support the view that both cities are well provided locally with respect to most day-to-day business service activities. Only the more specialised business services tend to be sourced regularly from other cities and it appears that for legal and financial services these may as easily be sourced in Wellington as Auckland.

Interesting responses and observations included:

- A strong theme in Tauranga was the motivation to buy locally and support local business service providers. As one respondent put it, "CEOs have a focus on buying locally but some specialized services are sourced from other centres."

- A major exporter in Tauranga told us that they sourced banking services for foreign exchange in both Auckland and Wellington. Specialist legal services were sourced locally and from Wellington where this was not possible.
- One major company had worked with a local Tauranga law firm to develop in-house resources to meet their legal needs locally.
- Another respondent saw "Tauranga becoming a more self-contained as a city" and respondents generally saw Tauranga as being "well provided for in terms of business service activities…KPMG in town, national level PR, creative, legal and accounting services."
- Another major Tauranga company confirmed, "they were self contained in legal, IT, tax, audit and engineering in Tauranga."

One respondent pointed out that "clients expect local solutions but want to be able to draw on specialist services across nationally recognised firms. That means the office in Tauranga or Hamilton acts as a front door to whole organisation." This was echoed by consulting planning and engineering firms. The general view was that local services were best provided from local offices and only for major projects were specialised skills required. These skills would be more likely to be present in larger offices around the country but there was no obvious policy amongst firms interviewed to create geographically specific centres of specialisation. It seemed to be more related to where a particular specialist lived.

In terms of the within firm linkages between the three cities, this is very hard to gather data on. The general perception amongst our interviewees in nationally significant business service firms was that around 90 per cent of the work that was brought in by the Tauranga and Hamilton offices was carried out using local resources. The remaining 10 per cent would be undertaken by specialists in other locations around the country.

The analysis of firm linkages supports the view that the three cities appear to operate as relatively independent economies and do not appear to exhibit any great difference in the patterns of firm linkages than would be expected between provincial cities and Auckland.

1.10 Forecast growth

Having summarised the current status of the economic linkages between the three cities we have then considered how these linkages might evolve over time, using a number of forecasts of potential changes in population, employment and the form of the transport network.

1.10.1 Population growth forecasts

Estimates of population growth for the study area have been made based on the high growth forecasts published by Statistics NZ to 2031 and then extrapolated to 2041 reflecting the substantial growth that has occurred over the past. The increases in population that result are set out below:

Table 1.7: Forecast population growth and growth rates for Auckland Metro, Hamilton and Tauranga 2006-2041

Area	Population		Average growth rate pa 2006-2041
	2006	2041	
Auckland Metro	1,126,000	2,131,300	1.7%
Hamilton	129,000	232,500	1.6%
Tauranga	104,000	204,400	1.9%
Sub total	1,359,000	2,568,200	1.7%
Total NZ	4,028,000	6,459,750	1.2%
3 cities per cent of NZ*	34%	40%	

*Source: Consultants Estimates *(Refers to Auckland Metro area - see footnote page 30 for definition)*

The three cities are forecast to continue to grow more strongly than the country as a whole. As a consequence, their share of total NZ population is expected to increase from 34 per cent in 2006 to 40 per cent in 2041.

1.10.2 Employment growth forecasts

Forecasts of the growth in the labour force and the level of employment have been made assuming that overall participation rates would remain broadly the same as today. Employment forecasts are set out in Table 1.8 although it should be notes that given the period over which forecasts are made the results are subject to considerable margins of error. As in the case of the population predictions, employment in the three cities is forecast to represent an increased share of the New Zealand total.

Table 1.8 Forecast Growth in Employment[6] 2006-2041

	Employment		
AHT Only	**2006 (1)**	**2041**	**Forecast growth**
Auckland Metro	478,860	842,784	76%
Hamilton	60,816	105,212	73%
Tauranga	44,127	84,371	91%
Total	**583,803**	**1,032,366**	**77%**
Other ARC	57,918	111,272	92%
Other Waikato	83,337	108,178	30%
Other BOP	59,632	76,677	29%
NZ Total	1,667,397		54%

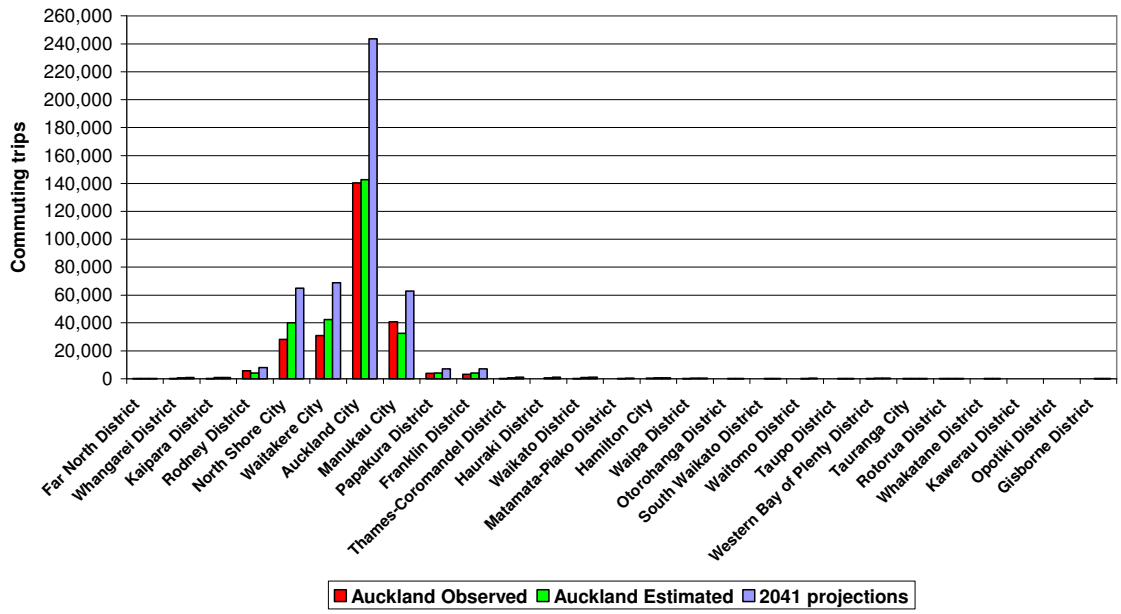
1.10.3 Future Transport Patterns

Commuting

[6] There are a number of definitions of the numbers employed. This table is based on the numbers employed as recorded in the 2006 Census and therefore includes full and part time workers. The numbers derived are therefore slightly different to those set out elsewhere in this report which reflect different measures.

Commuting flows in 2006 have been modelled using a simple gravity model formulation to assess the patterns of movement in future years. This indicates that the pattern observed in 2006 for the three cities, of a high level of self sufficiency and only very limited long distance commuting, is likely to continue assuming a continuation of existing travel times and travel costs. The findings for Auckland are set out in Figure 1.3:

Figure 1.3 Commuting into Auckland 2006 and 2041



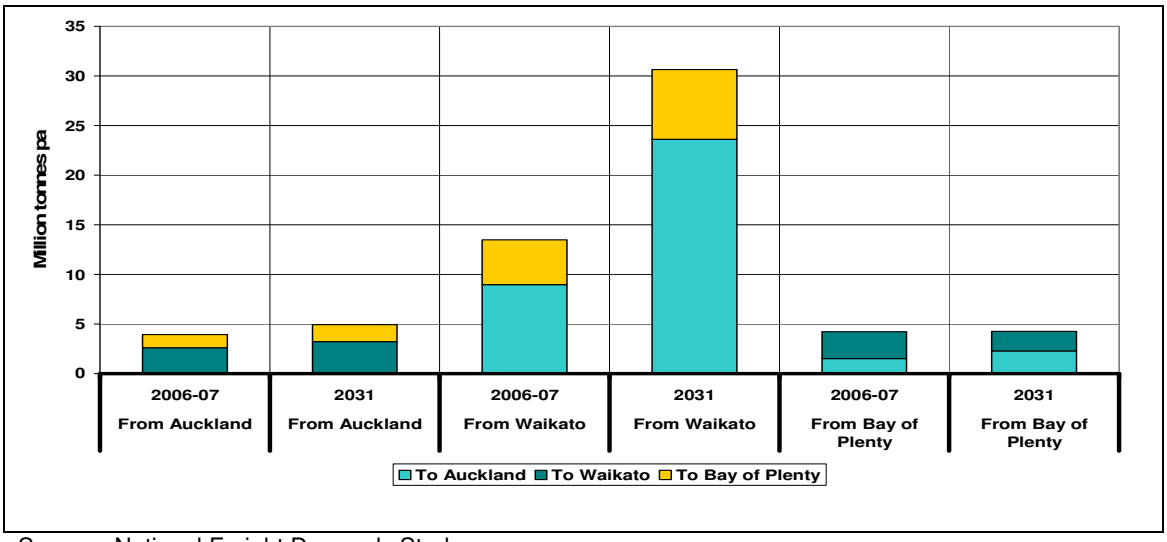
Source: Statistics NZ, Consultants Estimates

The modelling indicates that almost all of the forecast growth in employment in Auckland City is met by those living in the Auckland Metro area. The numbers commuting from outside this area, while increasing, continue to represent a very small proportion of the total number of trips. The numbers of longer distance commuters from Hamilton and Tauranga remain particularly small. There is no strong evidence from this analysis that in terms of the interaction of the labour markets the level of interconnection between the three cities can be expected to significantly increase.

1.11 Freight

The forecast growth in the volumes of freight travelling between the regions in the AHT study area is set out in Figure 1.4. These are derived from the National Freight Demands Study (NFDS) which originally forecast for 2031, but given the economic downturn the predictions for 2031 have been judged to be now appropriate for 2035.

Figure 1.4: Forecast Growth in Freight Movements Auckland, Waikato and Bay of Plenty



Source : National Freight Demands Study

Much of the increase in freight is associated with the increased movement of primary products, particularly aggregates, building materials, logs and timber products, which are largely generated away from the main urban areas. Growth in the volumes of manufactured imports, which form a significant part of the movements between the Port of Tauranga and Auckland are likely to be limited because of changes in distribution patterns, with increasing volumes of imports delivered directly to ports closer to subsidiary distribution centres particularly in the South Island. There may also be changes in the patterns of imports and exports between Tauranga and Auckland because of changes in shipping patterns and ship sizes, although there is considerable uncertainty about the scale and timing of these effects.

With the growth in the size and economic activities of the cities, the volume of freight distributed from Auckland (as the major manufacturing centre and distribution hub) to Hamilton and Tauranga will be likely to increase, as will the relatively smaller volumes produced in these cities for consumption in Auckland. This will be accompanied by increases in freight traffic within the cities meeting the increased needs of their inhabitants and workers.

1.11.1 Overall Growth Patterns

Overall, the degree of labour market interaction between the three cities is likely to remain very limited. Freight movements between the regions will increase, although much of this will reflect increased production of basic materials away from the main cities. Increases in purely city to city traffic are likely to be relatively small. However, freight movements within the cities, meeting the needs of commerce and residents will increase.

1.12 Potential Development Effects

In order to assess the potential impacts of possible future growth and infrastructure changes on the economies of the three cities and of the country in general, two sets of models have been applied; a Regional Agglomeration Model (RAM) and a Computable Generalised Equilibrium (CGE) model. The RAM develops estimates of changes in economic activity at a disaggregated level whereas the CGE model predicts at a national level. We use the growth projections to construct a number of scenarios which can be modelled to illustrate future development effects.

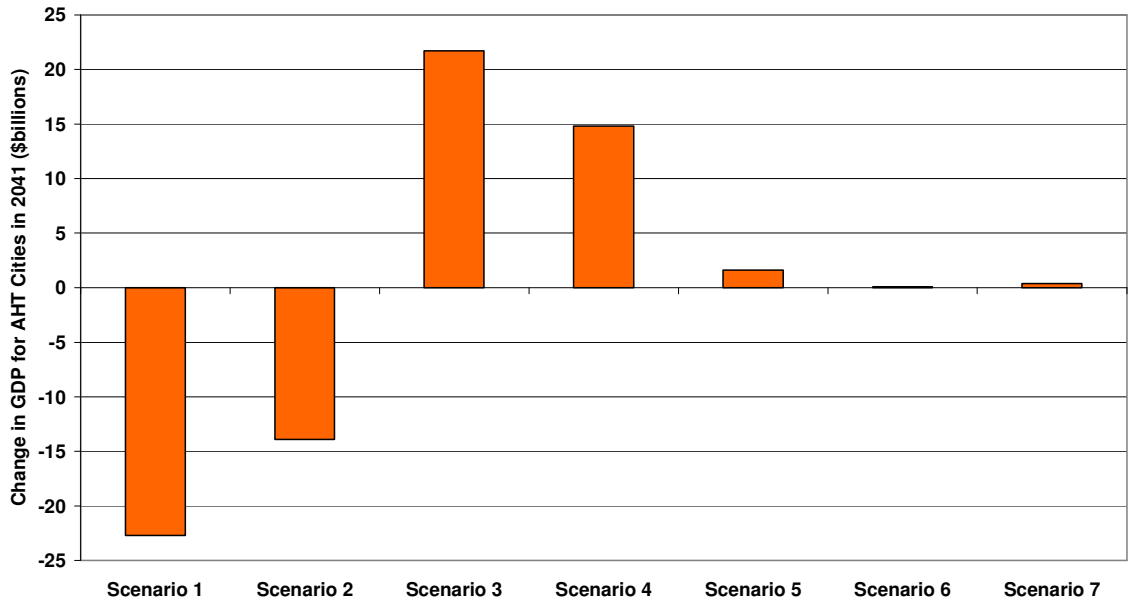
1.13 Scenarios and results - Regional Agglomeration Model

The RAM has been used to predict a Baseline case for 2041 based on our employment growth forecast for the three cities and assuming growth of GDP per head of about 1.8 per cent per year. A number of scenarios using alternative assumptions have then been tested. The scenarios are:

- **Scenario 1 Low employment growth:** Employment growth in the three cities is at the average level predicted for NZ as a whole for the period from 2006 to 2041.
- **Scenario 2 Relax Auckland's Metropolitan Urban Limits (MULs)**: proxies the effects of the relaxation of Auckland's MULs by redistributing some of the employment growth predicted for Auckland City across the Auckland region as whole.
- **Scenario 3 Concentration of employment growth in Auckland:** Effects of additional employment of 100,000 in Auckland in 2041 concentrated in the centre of the city.
- **Scenario 4 Concentration of employment growth in Hamilton and Tauranga:** Effects of employment increases of 100,000 in Hamilton and Tauranga, with this split equally between the two.
- **Scenario 5 Effects of growth of national sectors of importance under the government's Economic Growth Agenda (EGA)**: Estimated approximately by assuming changes in agglomeration elasticity to reflect a higher proportion of firms in higher value added activities**.**
- **Scenario 6 Inter-regional travel time savings:** Reducing the travel times **between** the three cities to improve accessibility within the region as might be achieved with specific projects.
- **Scenario 7 Intra-regional travel time savings:** Reducing travel times generally **within** the three cities to improve internal movements and commuting.

Our baseline forecasts indicate that GDP in the AHT cities and in their regions is expected to grow substantially between 2009 and 2041, driven by increases in overall employment. Also, an increasing proportion of this growth is expected to arise in locations characterised by higher value added activities, where there is the opportunity to gain from the benefits of agglomeration. The effects of the different scenarios on the GDP of the AHT cities in 2041 is set out in Figure 1.5:

Figure 1.5 Change in GDP of AHT Cities with Alternative Development Scenarios 2041



Source: Consultants Estimates

The key observations from the examination of the scenarios are:

- GDP in the AHT cities (and regions) is very sensitive to the level of employment growth and its distribution, illustrated by the following results.
- The low rate of growth tested in Scenario 1 would reduce GDP in the 3 cities by about 13 per cent.
- The more even spread of employment across the Auckland region tested in Scenario 2, analogous to the relaxation of the MULs, would reduce GDP by 8 per cent. Across the 3 regions as a whole this would reduce output by 3 per cent, despite total employment being the same as the base.
- An increase in employment in Auckland City would increase GDP in the AHT cities by 12 per cent. The same level of increase in Hamilton and Tauranga would give an increase of 8 per cent.
- The modelling of the EGA scenario has suggested that this would result in a relatively small increase in GDP. This has, however, only been modelled very approximately and this figure may be underestimated, possibly substantially. Further work would be required to investigate this further.
- The effects of increases in transport accessibility on overall regional output are relatively small (but possibly significant in relation to the investment undertaken). The benefits from improvements to intra-urban accessibility are much larger than those from improving inter-urban connections.

The model forecasts indicate that there are substantial benefits from encouraging employment expansion and in particular in concentrating this in central Auckland (Scenario 3) rather than distributing this more widely across the Auckland region as might result from a relaxation of the MULs. While there would be benefits from encouraging growth in Hamilton and Tauranga these would be smaller than the benefits from concentrating this in Auckland.

1.14 Conclusions

Overall, the analysis does not support the emergence of a city-system encapsulating Auckland, Hamilton and Tauranga. Rather we find the three cities are, to a large degree, economically independent of one another with limited interaction. There is a very low level of commuting between the three cities suggesting little in the way of agglomeration effects arising from integrated labour markets. This is also consistent with low level of business travel between the three cities, indicating relatively little face-to-face business activity taking place between the three cities.

For both commuting and business travel, the low flows are at least in part a reflection of the considerable travel times and distances between the three cities. Labour mobility into or within the AHT region could be facilitated via migration between the three cities, however, our analysis suggests that this is relatively small, compared to inward migration from the rest of New Zealand (for Hamilton and Tauranga) or from overseas (for Auckland). This situation is not expected to change significantly in the future.

From a freight perspective, important linkages do exist between the three regions in which the AHT cities are situated, with high freight flows between Auckland and Waikato and between Waikato and Bay of Plenty. However, these movements are dominated (in volume terms) by basic commodities, typically generated away from the cities. For many of these access to the ports in Auckland and Tauranga is very important and good freight connections support activity in the rural areas. Movements of freight by both road and rail will continue to grow in importance. Measures to accommodate this traffic will be required, again with an emphasis within the urban areas where this will be required to support the growing populations and levels of commercial activity.

Across the three cities, Auckland is the prime city. The reliance of Hamilton and Tauranga on Auckland is much greater than in the reverse direction. Measures to increase economic activity in the AHT region and in New Zealand generally are likely to have the greatest impact if focussed on Auckland rather than spread more widely

A key observation is that the three cities display fundamentally different economic foundations and that the economic prosperity of the three cities is strongly influenced by these foundations. While all have grown strongly in recent years, the foundations of this growth are different, Auckland dominates in the business services and financial sectors, providing high level services to the other areas and as discussed above dominates in the distribution sector supplying a range of goods and value added services to the other two cities. However the linkages in the reverse direction, other than those concerned with the movement of freight are relatively weak.

Hamilton and Tauranga are not strongly related to Auckland and have important roles of their own. Like most New Zealand provincial cities, for Hamilton the key factor in its initial growth was its role as a rural service centre. The surrounding Waikato region, with

its strong dairy industry provided Hamilton an economic base which it has successfully leveraged off to expand into new geographical markets and into new, but related sectors and activities, for example through the generalisation of agri-science and advanced engineering activity into new markets. In this respect Hamilton's economy displays an increasingly national role.

In contrast, the underlying economic foundations for Tauranga are comparatively weaker, in part caused by the relative remoteness of the city from other major areas of economic activity and in part by the limited opportunities for larger scale value added activities linked with production in the city or its rural hinterland. This also reflects the relatively recent expansion of horticulture in the Bay of Plenty (compared with dairying in the Waikato) and the role of Rotorua as the established service centre for forestry activities in the region. While it is likely that there is an important role for Tauranga as a key service and possibly local manufacturing centre for the Bay of Plenty, this is likely to be more significant in a regional rather than a national context.

In future, to support further economic growth there is likely to need to be an increasing focus on the growth of value added activity within urban areas. A key component of this will be the need for transport systems which provide sufficient levels of accessibility to support increasingly higher employment densities within the key employment centres, whilst preserving (or enhancing) levels of urban amenity. We strongly suggest that focusing on intra-urban linkages will be of greatest benefit.

1.15 Areas for further investigation

Although we have undertaken a comprehensive analysis of the economic relationships between the three cities, time and resource constraints have precluded further analysis of a number of relevant issues.

Specifically we would see the need to extend this analysis beyond the three cities to include the regional economic context. It is possible that although we have not identified strong city linkages there may be regional economic linkages which are important for the economy as a whole. These could be related to natural economic endowments, education, tourism and energy.

There is also the issue as to how specific policies might be developed to support the key issues we have identified. In particular, we have identified the levels of population and employment as a key driver of economic growth and ways of influencing this should be investigated.

Our work has also identified the importance of concentration rather than dispersal in the main urban areas and the ways in which this might be promoted or supported could also form a useful avenue of additional work.

2 Introduction

2.1 Objectives and purpose

The importance of cities and city-systems as drivers of economic growth is becoming increasingly recognised both internationally and within New Zealand. The regions encompassing Auckland[7], Hamilton and Tauranga comprise 38 per cent of New Zealand's population, account for 40 per cent of New Zealand's employees and produced 41.3 per cent of the country's GDP in 2009. The activities in the area range from high-end business and financial services, mainly concentrated in urban areas and particularly in Auckland through to primary production of simple basic materials such as coal, aggregates, milk and dairy products, horticultural products and logs and timber products within the broader AHT system.

In other countries, strong interconnections between neighbouring urban areas have been found to be important contributors to economic development within major urban areas. Whilst there has been investigation of the importance of city-links elsewhere, there has been little analysis of these factors in a New Zealand context. Given the dominance of the Auckland-Hamilton-Tauranga city regions within New Zealand's economy and the rapid growth that these have experienced, it is clearly important to investigate the role of existing and future economic linkages between these three cities in order to better understand the extent to which these linkages might impact on the economic structure and growth of each city-region. Accordingly, the purpose of this research project is to test for the emergence of a 'city system' between the Auckland, Hamilton and Tauranga (AHT) city-regions.

The specific objectives of the study are to identify the main economic connections between the AHT city-regions, the impact of growth of the AHT city system on the city-regions within it and the wider New Zealand economy and to propose a range of actions to assist in lifting the productivity of the AHT city-system.

2.2 Approach and structure of the paper

The study is based around five key steps. Step one involved the development of a comprehensive project methodology, based on:

- Identifying key economic linkages including the analysis of labour market, transport and firm linkages.
- Analysing the economic structure of each individual city-region including the location of different components of sectoral supply chains within the region and

[7] Where reference is made to 'Auckland' or 'Auckland Metro', this is defined as the area covered by four former cities of North Shore, Auckland, Waitakere and Manukau. This area is within the boundaries of the Auckland Council. Where reference is made to the 'Auckland Region' this is based on the region's boundaries prior to the formation of the Auckland Council in 2010. It is therefore equivalent to the area covered by the four cities plus Rodney, Papakura and the portion of Franklin included within the old Auckland region.

reasons for location, type/size of firms plus broader measures of economic performance;

- Assessing the level of connectivity between the three city-regions, including comparison with similar urban agglomerations; and
- Predicting the impacts of expected growth.

Within this report, Section 3 summarises our methodology and establishes the analytical framework we have used to underpin this study, based on the concepts of economic geography. Section 4 then provides a brief geographical summary of the AHT region as background context for the detailed analysis and modelling.

Then, based on the agreed methodology, in Section 5 we identify the main economic linkages within the system, including identification of the most economically 'productive' connections and consideration of how this network fits into the geography of the New Zealand economy. We do this through an examination of commuting flows, business travel patterns, air travel patterns and freight movements.

In Section 6 we complement this analysis with a consideration of population trends, migration patterns and educational attainment within the three city-regions.

Section 7 analyses the economic structure of the three city-regions and also compares the three cities with other New Zealand cities to assist in determining the presence of any unique economic characteristics within the AHT city-system. The analysis includes consideration of the labour force composition of the three city-regions, structural composition of the three city-regions' economies and changes in structures over time. This allows us to assess the impact of economic linkages on the economic structure and function of each city-region in the system, including the types and locations of firms in each city-region.

Section 8 considers the nature of connectivity of firms within the AHT Region through an analysis of supply chains.

In Section 9 we use the information and data collected to construct profiles of the three city-regions.

In Section 10 we apply modelling techniques to undertake an assessment of the levels of connectivity between the three city-regions in order to develop a view on how connected the three cities are and the strength of these connections within the overall city-system. We then use further modelling work to predict the impacts of potential growth using a number of hypothetical growth scenarios. This helps us to consider whether future growth is likely to alter and/or extend the economic structures of each city-region, and the wider economic geography of New Zealand, what the expected impacts of potentially greater flows of people and goods between these city-regions might be, where growth will be most likely to be centred under a Business as Usual scenario and what would the impacts of alternative scenarios for the future.

Section 11 sets out our key findings, including consideration of how these correspond with the expectations of a framework grounded in economic geography. We then set, in Section 12, a number of suggested actions to improve the productivity of the AHT city

system whilst avoiding adverse social and environmental impacts on the city-regions within it and other regions in New Zealand.

In any study such as this, the availability of data affects the robustness of the analysis and the conclusions that can be reached. Although there is a wealth of data available on the population and economic structure of each of the regions, the information available on the linkages between the cities is much more limited. Reasonably comprehensive data is available on the movements of commuters from the regular Censuses but information on other types of travel is much more limited. In addition there is information available on the movement of freight although this is primarily at a regional level and does not distinguish the position for the cities themselves. This data is only directly available in terms of the volumes moved and does not directly cover the values of the products moved. Some information is also available on business travel by car and on movements by air between regional airports but this is fairly limited.

There is also no direct information on the trade in services between regions. We have therefore had to make tentative estimates of the scale of this based on the level of employment in the various centres and the potential “deficits” and “surpluses” which appear to emerge from this. We also have collected some more anecdotal information on the scale of possible inter-regional transfers of services within the corridor from out interview survey but again the results of this are limited. However although we have not been able to derive direct estimates of the scale of this activity, we have been able to gain a general understanding of the pattern and the lack of detailed information is not considered to affect our general findings.

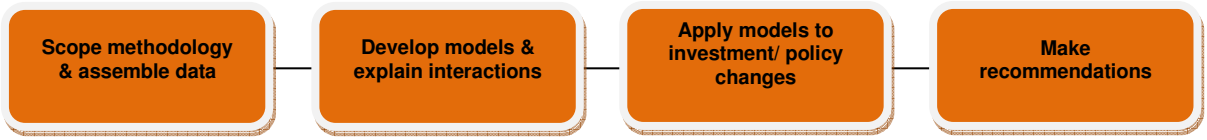
3 Methodology and Framework of Analysis

3.1 Methodology

3.1.1 Outline of our approach

Our approach involves four stages, illustrated in the diagram below, with the material in this section forming a part of the first stage.

Figure 3.1: Methodology – key steps



Our approach is grounded within the theoretical foundations of spatial economics. A key element of our methodology is the blending of analytical approaches with existing data sets that are available for the AHT city-regions in order to generate the most comprehensive analysis possible within the constraints of time and budget.

We focus on utilising a combination of transport data, census data, data relating to economic structure and composition and primary information from interviews. From this, we build up a sufficiently comprehensive view of the economic relationships within and between the three city-regions which encompasses patterns of movement, levels of connectivity, structural composition and how these can be related to change over time, both historically and into the future. The methodology addresses key factors in the following ways:

- We examine commuting flows in order to provide an indicator of, for example, the extent to which labour pools span AHT city-regions and the relationships between labour market accessibility, density and productivity in city-regions. The assessment includes examination of inter-regional migration flows.
- We analyse business travel to provide one indicator of the extent to which AHT firms are connected to one another through business-related engagements.
- We analyse freight movements to indicate the extent of freight transport linkages between the AHT city-regions.
- Service interactions are difficult to analyse, due to the limited data availability. We complement data with interview responses to assist with understanding this area.
- We analyse the economic structure of the three city-regions and the AHT system using data on employment, GDP and business units. This allows us to examine the industry composition of the AHT system in its entirety, as well as its component cities and examine snapshot differences in economic structure in terms of; labour productivities, industry structures, specialisations, diversity and

concentrations. We use the BERL Regional Database which contains data on employment, GDP and business units for each TLA in New Zealand at a detailed level for the last 15 years. The analysis covers:

- ***Employment by industry and industry concentrations***. We identify, at the ANZSIC 53-industry and 477-industry level of disaggregation, which industries are concentrated in different cities within the system and the skills-hierarchy as we move from Hamilton and Tauranga to Auckland.
- ***Labour productivity.*** We look at differences in sectoral composition assuming average wage rates or value added and look directly on a geographical basis at differences in earnings and/or productivity
- ***Earnings and employment density****:* Analysis of earnings by sector from LEED data or census data and linkage of this with employment density at a disaggregated level.
- ***Occupational make-up, skill levels and educational qualifications***: We look at workforce skill levels expressed in terms of educational qualifications for the individual urban areas and for the commuting flows between them for 2001 and 2006 (this information has been ordered from Statistics NZ).

- To assess levels of connectivity within the AHT system we develop models that focus on travel costs and agglomeration effects.
- We use benchmarking as a way of helping to ascertain the key differences in connectivity and economic structure observed in the AHT city-regions compared with other parts of New Zealand.

3.1.2 Relevant data and information

For this project, we develop our understanding and models utilising the following data:

Table 3.1 Select Data Sources

Data Source	Data type	Purpose in Study
Stats NZ Census 2006, Census 2001, Census 1996	Journey to Work (JTW) by TLA by income and education	Patterns of commuting flows by income and educational attainment
Stats NZ Census 2006, Census 2001, Census 1996	JTW by TLA	Totals for commuting (gravity) model
Stats NZ Census 2006, Census 2001	Place of residence at previous census	Migration patterns within the corridor
ARC Transport model	Business trips	Patterns of inter-regional business trip making in corridor
EW Transport model	Business trips	Patterns of inter-regional business trip making in corridor
Stats NZ Census 2006, Census 2001	Income by place of work (CAU) by sector	Agglomeration model
Stats NZ Census 2006	Employment by TLA	Agglomeration model
Stats NZ Census 2006	Migration by place of residence in 2006 and 2001, age and educational attainment	Patterns of migration within study area
National Freight Demands Study	Inter-regional freight movements by mode and	Assessment of corridor freight flows

	commodity	
BERL Database, built on Stats NZ business frame*	Employment by industry by TLA 1994 to 2009	Estimate industry concentrations, industry make-up of each city-region (Section 4)
Stats NZ Census data in BERL database	Employment by industry by TLA Census years 1996 to 2006	To generate Detailed industry employment profiles, and changes last 10 years (Section 4)
Stats NZ Census data in BERL database	Travel to work by TLA by industry; Census years 1996 to 2006	To explore changes in commuting patterns in last 10 years (3.2.1)
Stats NZ migration data, custom datasets	Tran Tasman travel incidence over time, by region of residence	To compare incidence of international travel by Waikato and Bay of Plenty residents compared with other regions (3.2.5)
BERL Computable General Equilibrium (CGE) Model	BAU simulated model of NZ economy in 2021	To explore impact on the economy of productivity changes due to AHT linkage impacts (Section 6)

*The BERL Regional Database incorporates business demographic data, census, population estimates and national GDP from Statistics New Zealand. This enables the calculation of population, employment, GDP, labour productivity, business unit, and industry concentration by TA.

In addition, we have gathered primary information on firm linkages via interviews to supplement the data analysis and help us understand and interpret the data.

3.2 Background – Urbanisation and the growth of cities

One of the most striking trends of recent history is the rapid urbanisation of developed and developing countries and the increasing concentration of economic activity taking place in relatively small geographical areas. In approximately half of OECD countries, more than 40% of the national GDP is produced in less than 10% of all regions.[8] In the United States 40% of employment is currently located in areas constituting just 1.5% of its total land mass.[9] As Scott and Storper (2007) observed:

> *"The most striking forms of agglomeration in evidence today are the super-agglomerations or city-regions that have come into being all over the world in the last few decades, with their complex internal structures comprising multiple urban cores, extended suburban appendages, and widely-ranging hinterland areas, themselves often sites of scattered urban settlements. These city-regions are locomotives of the national economies within which they are situated, in that they are the sites of dense masses of interrelated economic activities that also typically have high levels of productivity by reason of their jointly- generated agglomeration economies and their innovative potentials."*[10]

Cities and city-regions have reaped the benefits of a structural transformation that has taken place in most modern economies. Cities now thrive through the concentration and provision of high value added service activities rather than a reliance on manufacturing, which supported the growth of many cities in the 19th and early to mid-20th centuries,

[8] OECD, 2009, Regions at a Glance.
[9] Scott, A.J. and Storper, M., 2003, 'Regions, Globalization, Development', *Regional Studies,* Vol. 37: 6&7, pp 579-593. p7.
[10] Scott and Storper, 2003, Ibid p8.

although manufacturing may still be an important activity within them. However, cities don't exist in isolation, they form part of a network of economic and social connections, running within and between countries. These connections play an important role in the continued development of cities. Of particular importance are the benefits that can be derived from links to other large city-regions in close proximity.

Within these relatively local connections supply chains allow increasing value to be added to output whilst commuters travel across city-regional boundaries to access the most productive jobs. Larger, better connected places are typified as having different workforce compositions to less connected places, with more highly skilled knowledge workers and more specialisation of tasks, a greater range, size and type of firms and are likely to be more productive.

3.3 Economics and geography

Accordingly, the economic framework that we will be using in this study is grounded in the field of economic geography and relies heavily on the concept of agglomeration. We identify the main themes within this field of study and then look in more detail at the literature relating to cities and city-regions.

3.3.1 Key themes of economic geography

McCann (2009) suggests that "a coherent understanding of New Zealand's current economic predicament can be gained by examining the modern interrelationships between geographical location, economies of scale, and the diversity of production and trade."[11] Similarly, for our purposes, it will be vital to account for the influence of these geographical factors and it is therefore useful to firstly summarise these interrelationships; scale, location and economic diversity.

Scale is important at the national level, where larger domestic markets, such as Australia's for example, can provide economies of scale far beyond those achievable within a small, isolated country such as New Zealand.[12] Scale also matters at the city or regional level and as McCann (2009) points out, although no simple direct relationship exists between urban scale and productivity, "all of the world's most productive cities are at least twice the size of Auckland, and importantly for New Zealand, most are between three and five times the size of Auckland."[13] In fact, Auckland is smaller than the top 70 urban agglomerations in the OECD and according to Rowe (2006) "cannot be considered a global city."[14] However, Auckland does undertake many of the functions of global cities, albeit on a much smaller scale and is a significant driver of New Zealand's economy, which indicates that Auckland is probably most appropriately classified as a 'globalising city'.[15] In the following section a more detailed explanation is provided of the

[11] McCann, P. (2009) "Economic geography, globalisation and New Zealand's productivity paradox," New Zealand Economic Papers, Vol 43, No 3, pp 279-314.p280.
[12] NZIER 2006, McCann, 2009, Ibid. p287.
[13] OECD 2006 in McCann, 2009, Ibid. p297.
[14] Rowe, J.E. (2006) "*Is Auckland an entrepreneurial or global city*?", Town Planning Review, Vol 77(5) pp583-604.
[15] Williamson, J. and Waite, D. (2007). 'Cities: Engines of Growth in the World Economy', report prepared for the Ministry of Economic Development. p37.

importance of agglomeration economies arising from the scale and density of urban areas in explaining differentials in productivity and economic growth between cities.

Location matters. Analysis from the OECD and World Bank finds that at the country level New Zealand and Australia suffer the greatest adverse effects of geographical isolation on productivity of any advanced economy in the world.[16] The IMF found that the effect of this isolation reduces labour productivity in Australia and New Zealand by just over 10 per cent.[17] However, whereas the negative effect of Australia's relative isolation on labour productivity is compensated for by the size of it's own markets, this is not so for New Zealand, where the small country effect actually adds to the productivity gap.[18] Location is equally important for cities in the global economy, where, apart from Perth, New Zealand's cities are ranked the word's most isolated advanced urban economies.

Finally, according to McCann, economic diversity in production and trade supports a more productive economy. At the country level New Zealand is characterised by a noticeably high reliance on land based exports and the lowest level of export diversity for any developed economy.[19]

3.3.2 A perspective on the AHT region

Following the deregulation of the 1980s and 1990s, New Zealand has become an economic region of Australasia, with Auckland as its economic centre. Maré (2008) confirms this result, demonstrating that the size distribution of New Zealand's cities reasonably reflects the results that would be expected if Australia and New Zealand were treated as one economic region.[20]

However, Auckland is a relatively small and isolated city by OECD standards and is also relatively distant from the core of our own economic region. Only Tasmania exhibits lower regional productivity than New Zealand and the age distribution patterns of labour migration to Australia from both New Zealand and Tasmania are very similar.[21] This suggests that New Zealand's geographical separation form Australia might be one determining factor in both the country's and Auckland's relative economic performance.

The central tenets of economic geography strongly suggest that increasing Auckland's scale will be economically beneficial, as will reducing Auckland's isolation and encouraging economic diversification. Therefore, an important question for us to consider is whether the growth of Hamilton and Tauranga will contribute positively towards increasing Auckland's economic scale, diversity and connectivity to other regions of Australasia and beyond or whether growth in these cities occurs at the expense of Auckland? Answering this question requires some understanding of the factors supporting the growth of cities and the literature relating to city-regions.

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[16] OECD 2008 (b,c) World Bank 2009b in McCann 2009 p287.
[17] IMF 2004 in McCann 2009, Ibid. p287.
[18] McCann 2009, Ibid. p287
[19] OECD 2008 (a,b), in McCann 2009, Ibid. p287.
[20] Maré, David C. 2008. "Labour Productivity in Auckland Firms," *MED Occasional Paper* 08/09, Ministry of Economic Development, Wellington.
[21] McCann, 2009, Ibid. p296

3.3.3 Agglomeration – driving the growth of cities

A key factor underpinning the structural economic transformation and growth of modern cities is agglomeration, the clustering of people and economic activity in larger, denser urban agglomerations generating higher levels of productivity and higher returns to businesses and workers.[22]

Agglomeration theory postulates that the congregation of businesses and workers is driven by the existence of positive externalities (or benefits which are external to firms), generated through close spatial proximity and raising the efficiency of firms. The literature emphasises three sources of agglomeration economies, roughly following three examples given by Marshall (1890) as follows:[23]

- **Input-output linkages** promoting more efficient provision of intermediate inputs to firms in greater variety and at lower cost. Here a "concentration of producers using particular inputs allows increased specialisation and greater economies of scale in the production of inputs."[24]
- **Larger labour markets.** With increased urban size, deeper labour markets are likely to arise. This "may allow greater specialisation in human capital, by reducing the risks to workers of firm specific employment shocks. Similarly it will be easier for firms to find new employees, should current employees quit"[25].
- **Technological or knowledge spill-overs** between firms. Here agglomeration facilitates faster communication and transfer of information across firms.

However, as noted in the Manchester Independent Economic Review (MEIR 2008) when formulating policy, it is important to understand why firms and workers benefit and then to understand the channels through which this happens.[26] Duranton & Puga, suggest that the Marshallian externalities can be better understood through an awareness of sharing, matching and learning mechanisms, where:[27]

- Sharing refers to "indivisible facilities" (e.g. machinery with high fixed costs that few firms would buy individually), the "gains from a wider variety of input suppliers that can be sustained by a larger final-goods industry", the "gains from the narrower specialisation that can be sustained with larger production, and risks".
- Matching refers to an ability to improve quality (e.g. improving the match between the skills demanded by business and the skills available in the workforce) and alleviate "hold-up problems"

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[22] Ascari Partners Ltd and Richard Paling Consulting (2007a), *Assessing Agglomeration Effects in Auckland: Linkages with Regional Strategies*, report prepared for the Auckland Regional Council p1.
[23] Marshall, A. (1920*). Principles of Economics*. Macmillan: London.
[24] Crawford, R. (2006). 'The effects of agglomeration on economic activity – the empirical evidence on mechanisms and magnitude', MED Working Paper 06/03.
[25] Crawford (2006)
[26] Manchester Independent Economic Review Secretariat, 2010, Manchester Independent Economic Review: Literature Review.
[27] Duranton, G. & Puga, D. (2004). 'Micro-foundations of urban agglomeration economies'. In Henderson & Thisse (Eds.) *Handbook of Urban and Regional Economics*, Vol.4: 2063-2118, Elsevier North-Holland: Amsterdam

- Learning refers to the “generation”, “diffusion” and “accumulation of knowledge”

Through these externalities and mechanisms agglomeration processes can be expected to drive productivity growth in city-regions.

3.3.4 The economics of city-regions

Moving from theory to practice, the patterns of urbanisation that are widely observed around the world indicate the growth of cities but also the increasing presence of city-regions, characterised by new centres emerging in, or, at the edges of cities, or, the fusion of relatively independent and distinct cities into wider metropolitan areas and polycentric city regions.[28] In the view of Meijers and Burger (2010) the ‘city’ is becoming a regional phenomenon.”[29] A potential criticism of the agglomeration literature is that many studies are based on definitions of urban areas which correspond to industrial images of the city (a monocentric view).[30]

A polycentric region is characterised as having co-located, multiple centres or cities, which interact and provide multiple sources of agglomeration economies.[31] The monocentric model is based on a city having one centre and a clear declining density gradient from the city centre outwards. Auckland is probably becoming a small but identifiably polycentric city, with the dominance of the CBD remaining whilst distinct sub-regional centres continue to grow e.g. Manukau, Takapuna, Newmarket and Henderson.

It is useful to consider the meaning of the term ‘city-region’ as the broader spatial economic literature reflects a number of different interpretations.[32] Some authors see this to be characterised by a series of towns “physically separate but functionally networked, clustered around one or more larger cities” [33] whilst others focus on integrated sets of cities and their surrounding suburban hinterlands.[34] However, a common theme amongst all writers is that the “emerging spatial form of post-industrial urban regions is quintessentially polycentric.”[35]

Importantly, the concept of ‘city-regions’ emphasises that external economies are not confined to a single urban core, but are shared among a collection of nearby and linked

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[28] Meijers E J, and Burger M J, 2010, "Spatial structure and productivity in US Metropolitan areas" *Environment and Planning A* 42(6) 1383 – 1402. p1383.
[29] Meijers and Burger , 2010, Ibid. p1398.
[30] Meijers and Burger , 2010, Ibid. p1398.
[31] Meijers and Burger , 2010, Ibid. p1384.
[32] Parr, J. (2005) 'Perspectives on the City-Region', Regional Studies, 39(5), pp.555-566. p556.
[33] Hall, P. and Pain, K. (2006)The Polycentric Metropolis: Learning From Mega-City Regions In Europe. p3.
[34] Florida, R, Gulden, T. and Mellander, C. (2008) ‘The Rise of the Mega-Region’, Cambridge Journal of Regions, Economy and Society, Vol. 1, Issue 3, pp. 459-476, 2008. p459.
[35] Meijers and Burger , 2010, Ibid. p1383.
Alonso, W. (1973) Urban Zero Population Growth, Daedalus, 109, pp. 191-206, in Meijers and Burger , 2010, Ibid. p1384.
Phelps, N.A. and T. Ozawa (2003) Contrasts in agglomeration: proto-industrial, industrial and post-industrial forms compared, Progress in Human Geography, 27, pp. 583–604. p594.
Sassen, S. (2007) Megaregions: Benefits Beyond Sharing Trains and Parking Lots? In: K.S. Goldfeld (ed.) The Economic Geography of Mega-Regions. Princeton, NJ: The Policy Research Institute for the Region.

cities."[36] For example, a study of agglomeration effects in Montreal found a dispersal of 'high-order service employment' to growth nodes outside the CBD and that many high-order service firms left the CBD, to relocate in other centres within the metropolitan region.[37] Coffey & Shearmur (2005) considered this pattern of dispersion to be more favourable in terms of the attainment of agglomeration benefits than a general scattering across the metropolitan area.[38]

Meijens and Burger considered whether different spatial patterns affected the economic performance of US metropolitan areas by examining labour productivity. The analysis revealed that polycentricity in these cities is associated with higher labour productivity."[39] Nevertheless, as Kloosterman & Musterd observe, "central city locations still matter. This holds especially in the case of innovative activities based on the exchange of richly layered information demanding a high frequency of face-to-face contacts."[40]

Intra- vs inter-urban polycentrism

Importantly for our purposes, most of the relevant literature concentrates on 'intra-urban' polycentrism, relating to an individual city or city-region which incorporates multiple economic centres, rather than inter-urban polycentrism which considers the relationship between distinctly separate city-regions, one focus of our study.[41] [42] For example Bontje and Burdack (2005) examine the concept of edge cities. [43] These are recently formed, large multifunctional concentrations of offices, retail, leisure and housing areas at a considerable distance of the 'historic' central city. The authors demonstrate that development tendencies in the US and some European metropolitan regions bear resemblance to edge cities.[44] In Auckland, Manukau and Albany can be seen as being examples of this type of growth pattern, albeit on a relatively small scale.

However, the analysis of Meijers and Burger (2010) does provide us with two important clues that may assist us to understand what the economic implications of polycentrism both within and between cities might be:

- Firstly, the result that the more polycentric a region is, the higher labour productivity, was interpreted as appearing "to confirm ideas that agglomeration externalities spread over larger distances, and may interact in regions where multiple urban places, and hence, multiple sources of agglomeration externalities,

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[36] Meijers and Burger , 2010, Ibid. p1383.
[37] Coffey, W.J. & Shearmur, R.G. (2002). Agglomeration and dispersion of high-order service employment in the Montreal Metropolitan region, 1981-1996. *Journal of Planning, Literature* 17, 1: 85-168.
[38] Coffey and Shearmur (2002) Ibid. p159.
[39] Meijers and Burger, 2010, Ibid. p1398.
[40] Kloosterman, R.C, & Musterd, S. (2001), 'Polycentric urban region as a research concept', *Urban Studies*, Vol. 38(4): 623-633. p630.
[41] For example, see Kloosterman, R.C, & Musterd, S. (2001), Ibid.
[42] Riguelle, F., Thomas, I. and Ann Verhetsel, A. (2007) Measuring urban polycentrism: a European case study and its implications, Journal of Economic Geography, Volume7, Issue2, Pp. 193-215.
[43] Bontje, M. and Burdack' J. (2005) 'Edge Cities, European-style: Examples from Paris and the Randstad', Cities, Volume 22, Issue 4, August 2005, Pages 317-330.
[44] Bontje and Burdack (2005), Ibid. p317.

are co-located."[45] This aligns with the view of Phelps and Ozawa (2003) that external economies are not confined to a single urban core, but instead, are shared among a group of functionally linked settlements.[46] A key issue for our study is over what distances might these effects be expected to remain real?

- Secondly, it was found that a network of geographically proximate smaller cities cannot substitute for the urbanisation externalities (urbanisation economies related to the provision of urban amenities) of a single large city.[47] This leads to a question of whether growth in Hamilton and Tauranga would be less productive than similar growth in occurring in Auckland?

The importance of proximity

Considering the question of proximity, a useful piece of analysis was undertaken by the Northern Way Research Programme intended to address concerns around spatial economic disparities in the the United Kingdom.[48] This examined whether, as growth continued to be concentrated in cities, this would continue to be disproportionately concentrated in London and the Greater South East and if so what role might the northern English cities play in this economic future? More specifically, the report looked at strengthening the economic relationships between two northern English cities, Manchester and Leeds. It noted that "these cities are of particular interest because, while both cities have recently experienced strong economic growth, existing research finds little evidence of interaction in terms of business connections or commuting, despite their geographical proximity."[49] The report highlighted the importance of transport links, and of population movements in generating economic growth between neighbouring city-regions and found that reducing travel times between Manchester and Leeds could deliver productivity gains of £6.7 billion across the north of England.[50] However, the two cities are only 65 kilometres apart, are connected by the M62 motorway and have a direct rail link which also connects both cities directly with each other's airports and yet they had continued to grow in relative economic isolation.

Recent research and strategies have suggested that economic development in Auckland, Hamilton and Tauranga is to some degree linked, notably for freight traffic and migration.[51] However, on the basis of the observations from the UK, even relatively close proximity does not guarantee any significant degree of economic inter-action between city-regions. Section 4 elaborates on this point by examining the geographical context of the AHT region in comparison with other selected city-regions.

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[45] Meijers and Burger , 2010, Ibid. p1399.
[46] Meijers and Burger , 2010, Ibid. p1399.
[47] Meijers, E.J. (2008a) Summing small cities does not make a large city: Polycentric Urban Regions and the provision of Cultural, Leisure and Sports Amenities, Urban Studies, 45, pp. 2323-2342. p2340.
[48] The Northern Way and Spatial Economics Research Centre, (2009), *Strengthening Economic Linkages between Leeds and Manchester: Feasibility and Implications.*
[49] The Northern Way and Spatial Economics Research Centre, (2009), Ibid. p3.
[50] The Northern Way and Spatial Economics Research Centre (2009), Ibid.
[51] Statistics New Zealand, *Commuting Patterns in New Zealand: 1996-2000. Workforces on the Move,* Hyder Consulting for Environment Waikato, *Auckland Regional Land Transport Strategy 2010-2040* (Auckland Regional Council) and *Bay of Plenty Regional Land Transport Strategy Annual Report 2007/8* (Environment Bay of Plenty).

3.3.5 Focus of our analysis

Therefore, based on the discussion above our analysis will include consideration of the following economic drivers and indicators:

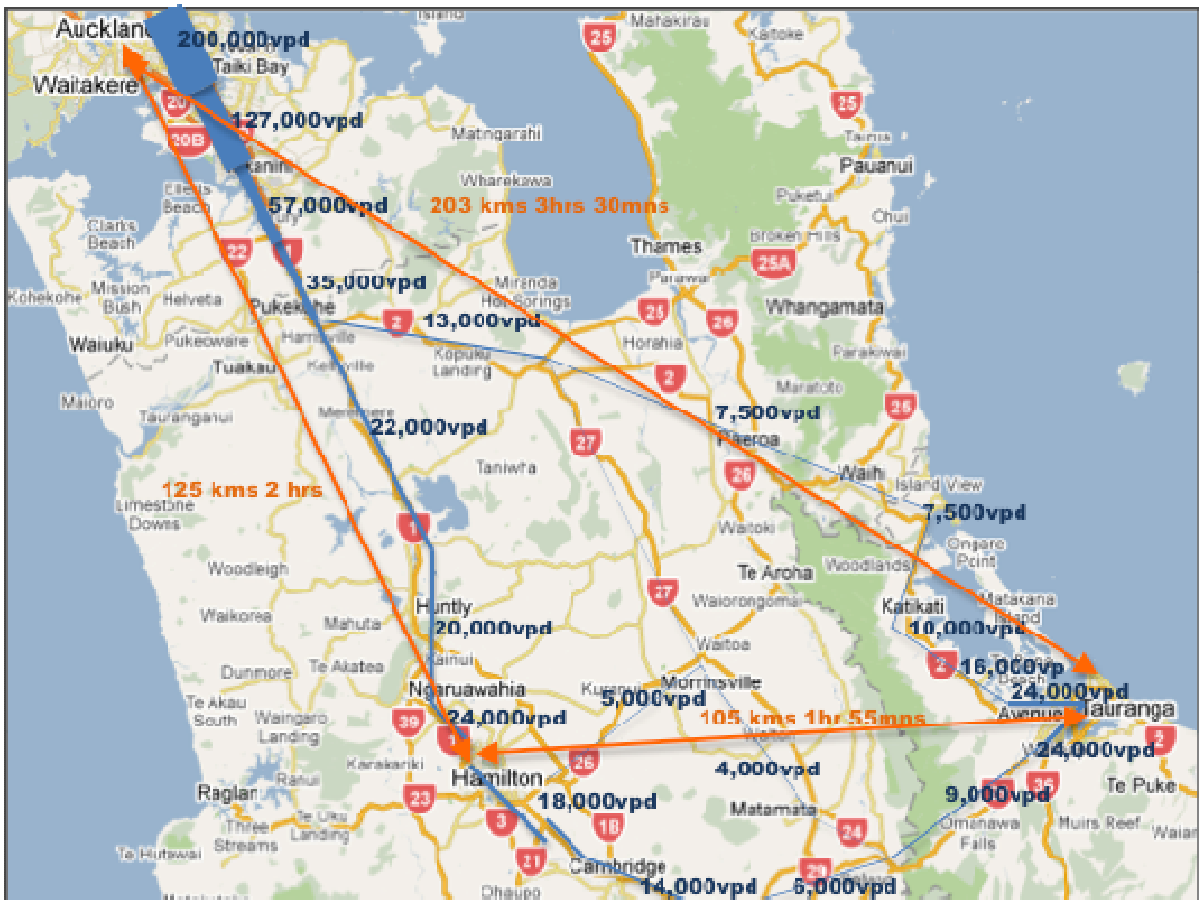
- Accessibility in terms of both physical distance and travel times within and between city-regions. So, for example agglomeration or the concentration of economic activity can assessed using measures of density based on time, distance and the relative sizes of the urban areas.
- Analysis of labour markets including: size, occupational make-up and skill levels; and the degree of labour market interactions between the AHT city-regions.
- The relative size of urban agglomerations including concentrations within industry sectors (or clusters).
- The diversity of production and the frequency of transactions between firms along supply chains, including the presence of specialisation.
- The level of innovation and knowledge-intensity of firms.
- The presence of sharing of indivisible facilities within or across city-regions.
- The extent to which the growth of Hamilton and Tauranga adds to or subtracts from Auckland's productivity.

4 Outline of the AHT Region

In a study grounded in economic geography it is useful to create a picture of the geographical characteristics of the AHT region. It is also useful to compare the AHT region with other regions and city-systems to help to begin to understand key aspects like the likely scale of an integrated city-system. The map below provides information travel times, distances and vehicle flows on State Highways and key routes between the three city-regions.

Map 4.1: The AHT Region – distances and vehicle flows[52]

[52] See Appendix 3 for schematic map with distances and traffic flows on all main routes.



Source: NZTA for traffic flows

The vast majority of trips take place within the three cities, with a sharp decline in daily vehicle volumes (VPD) as distance from the three city centres increases.[53] Two of the most important parameters determining the effectiveness of physical linkages between the three city-regions are time and distance. The table below provides more information:

Table 4.1: Distances, Average Travel Time[54] and Speed between the three cities

Trip	Distance (kms)	Time (hrs/mins)		Av Speed (km/h)	
		Slowest	Fastest	Low	High
Auckland - Hamilton	125	2.00	1.50	62.5	68
Auckland - Tauranga	203	3.30	2.55	58	70
Hamilton - Tauranga	107	1.55	1.20	56	80

Sources: NZAA, Tourism NZ and Tiki Tours time/distance calculators

User perceptions of the quality of the journey are also important. Responses to interviews confirm that the journey between Tauranga and Hamilton is widely perceived to be too long to undertake on a regular basis and is unattractive from a safety perspective. A key geographical feature of this journey are the Kaimai Ranges, creating

[53] NZTA Historic State Highway Volumes, available from: www.nzta.govt.nz/network/operating/counting-traffic/traffic-statistics.html

[54] These travel times are only approximations and are not intended to reflect the fastest possible trips between cities. It is worth bearing in mind that trips which coincide with the times at which the roads are most congested will take longer than average.

a barrier between the Waikato and Bay of Plenty regions. The journey between Auckland and Tauranga was also perceived to be too long to undertake on a regular basis. In contrast, the journey between Hamilton and Auckland was felt to have become significantly easier with the improvements to State Highway 1.

As noted in Section 3.2.4, even relatively close proximity does not guarantee any significant degree of economic inter-action between city-regions. However, when compared to spatial patterns of development in other countries Auckland, Hamilton and Tauranga do not appear to be relatively close at all. As a comparator, the relative distance of Hamilton (125 kms) and Tauranga (200kms) from Auckland was applied to London. The inner circle has a radius of 125 kilometres and easily covers the whole of the south east of England and extends far enough to include places such as Oxford, Swindon, Southampton, Ipswich, Norwich, Cambridge and Coventry. The outer circle (radius 200 kilometre) extends to cover the cities of Bristol, Birmingham and extends north as far as Nottingham. The comparison emphasises that although Hamilton and Tauranga are the closest cities to Auckland, in many developed countries the distances between these three cities would be likely to be regarded as quite high. This position is actually exacerbated in New Zealand because of the absence of rail connections.

Looking back to the literature on the development of city regions, we note this has tended to focus on the transformation of closely located urban centres into seamless, connected urban areas with multiple centres. This can happen within cities or between closely located cities, such as Amsterdam, Rotterdam and The Hague in the Netherlands. But, as observed in the Northern Way study (see section 3.3.4) in the UK, even well connected cities as little as 65 kilometres apart can be effectively economically independent of one another. This is not to say that movement and trade does not take place between these cites. All cities thrive on networks and connections and benefit from improvements to these. However, that does not mean they are economically integrated within a unified city-system. Given the distances between Auckland, Hamilton and Tauranga, one would not automatically assume that these three cities would be likely to be closely economically integrated and developing into an integrated city-system.

5 Current Position: Identifying the Economic Linkages between the three City-Regions - Movements between the Three Cities

5.1 Introduction

In considering the economic linkages between the three city-regions, in general Auckland has been defined as the combination of the four main cities of Auckland, North Shore, Waitakere and Manukau, and Hamilton and Tauranga have been defined as the appropriate TLAs. However for the consideration of freight movements, information is only available at a regional level.

In addition, to provide comparators with the positions for Tauranga and Hamilton, the position for Whangarei and Rotorua has also been examined and some results for these are also included. These areas have also been defined in terms of the TLA area, but recognising that these cover substantial rural areas as well as their urban cores.

5.2 Commuting patterns

Commuting patterns within and between the three cities have been analysed using information from the journey to work data collected as part of the regular census. While the analysis concentrates on the position for 2006, the opportunity has also been taken to look at changes over the period from 1996. The pattern of commuting flows as derived from the 2006 Census for the AHT corridor is set out in Table 5.1:

Table 5.1: Commuting Patterns in the AHT Region 2006

	Place of work					
Area of residence	Auckland	Hamilton	Tauranga	Rotorua	Whangarei	Total all defined destinations
Auckland	441,390	387	174	135	321	465,468
Hamilton	573	46,890	90	81	45	54,216
Tauranga	365	174	37,554	348	42	42,627
Rotorua	165	78	267	24,543	18	27,021
Whangarei	321	27	15	12	26,379	28,092

Source: Statistics NZ

Within the AHT region the highest commuting flows by a substantial margin are found within each of the three cities, as would be expected. Although small, flows to Auckland from Hamilton and Tauranga are higher than those in the reverse direction typically by a factor of 1.5 to 2 indicating the importance of Auckland as an area of attraction. For the smaller cities of Whangarei and Rotorua, however the flows are typically more balanced.

The numbers of workers from the selected cities as a proportion of the total workforce in the employing area are set out in Table 5.2:

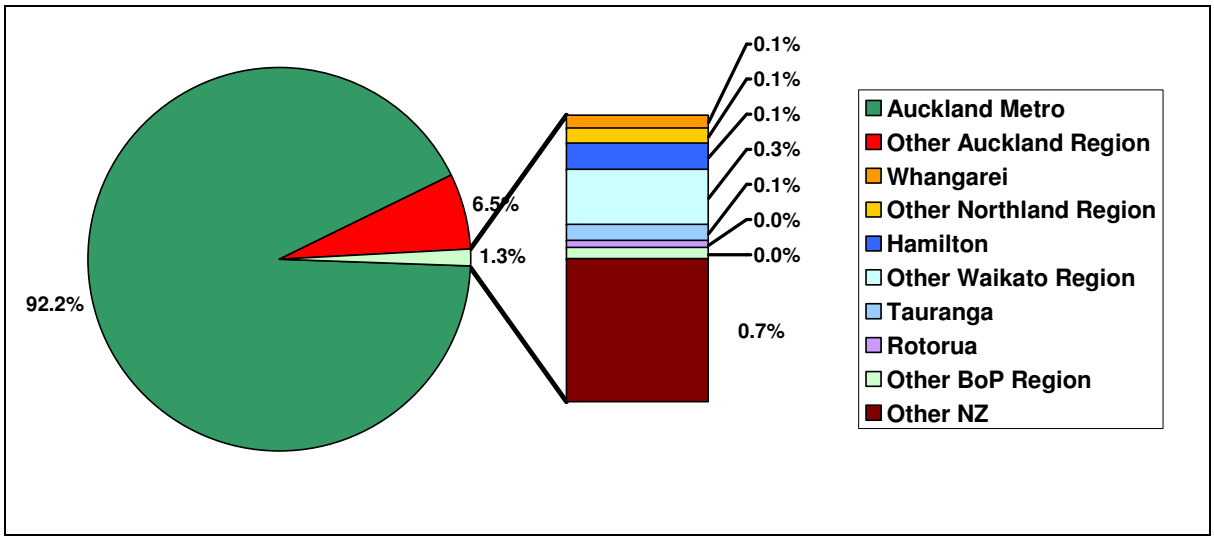
Table 5.2: Commuting Patterns in the AHT Region 2006[55]

	Place of work		
Area of residence	Auckland	Hamilton	Tauranga
Auckland	92.2%	0.6%	0.5%
Hamilton	0.1%	77.1%	0.2%
Tauranga	0.1%	0.3%	85.1%

Although the flows between Auckland and the other two cities are broadly balanced, because of the relative sizes of the areas, the flows outbound from Auckland represent a much higher proportion of the workforces in the attracting areas than is the case for the reverse flows. The overall breakdown of the sources of workers in the Auckland Metro area is set out in Figure 5.1:

Figure 5.1 Breakdown of Auckland Workers by Area of Residence 2006

[55] Commuting flows as a per cent of workforce in the attracting area.



Source : Consultants Estimates

Again this demonstrates and confirms the high level of self sufficiency and the very limited flows into the Auckland Metro area from outside the Auckland region. This size of the commuting flows between the three cities in relation to the resident populations can also be assessed and the position is set out in Table 5.3:

Table 5.3: Commuting Patterns in the AHT Region 2006 by Source of Workers[56]

	Place of work		
Area of residence	Auckland	Hamilton	Tauranga
Auckland	94.8%	0.1%	0.0%
Hamilton	1.1%	74.7%	0.2%
Tauranga	0.9%	0.4%	76.7%

Again, because of the relative sizes of the areas, Hamilton and Tauranga provide employment for a very small share of the workforce living in Auckland, but Auckland provides a larger (although still very small) share of employment for workers living in Hamilton or Tauranga.

In addition to considering the position in 2006 an assessment has been made of changes over time. The changes in the commuting flows over the period from 1996 are set out in Table 5.4:

Table 5.4: Commuting between the Three Cities - 1996, 2001 and 2006

	Place of work		
Place of residence	Auckland	Hamilton	Tauranga
1996			
Auckland Metro	361,839	162	84
Hamilton	444	40,409	99
Tauranga	162	81	25,713

[56] Commuting flows as a per cent of workforce in the generating area.

2001			
Auckland Metro	379,278	294	147
Hamilton	516	39,699	108
Tauranga	267	123	29,733
2006			
Auckland Metro	441,390	387	174
Hamilton	573	46,890	90
Tauranga	363	174	37,554
Growth 1996-2006 (Per cent)			
Auckland Metro	22%	139%	107%
Hamilton	29%	16%	-9%
Tauranga	124%	115%	46%

Over the period from 1996 commuting flows between Auckland and the other two cities have grown sharply, but with particularly strong growth over the period to 2001 and more limited growth in the subsequent 5 years. For Tauranga the growth of outbound commuting flows to Auckland and Hamilton has again been strong but has been similar in the two periods. For Hamilton a different picture emerges of relatively modest growth in commuting to Auckland and a decline in the numbers commuting to Tauranga. In research undertaken by Barrett et al (2009) it was found that the Kaimai Ranges create an effective geographical border between the Waikato region and Bay of Plenty region labour markets, which is consistent with the commuting patterns we have observed.[57] Barrett et al (2009) also found that the South Auckland and Glenbrook labour market was observed to extend into the Waikato region which is consistent with our observations around commuting patterns from the Auckland region to the Waikato.[58]

In order to determine whether the pattern for the AHT may be more widely observed, a similar analysis was undertaken looking at the position between Palmerston North and Wellington, possibly the city pair which has the closest similarity with the AHT corridor. The flows between these cities (and also Auckland for 1996, 2001 and 2006 are set out in Table 5.5:[59]

Table 5.5: Commuting between Alternative City Pairs : Palmerston North and Wellington 1996, 2001 and 2006

	Place of work		
Place of residence	Auckland	Palmerston North	Wellington (4 cities)
1996			
Auckland Metro	361,839	72	582
Palmerston North	93	27,522	159
Wellington (4 cities)	705	111	146,823
2001			
Auckland Metro	379,278	75	621

[57] Barrett, P., Cameron, M.P., Cochrane, W. and McNeill, K. 2009, *Labour Market Areas in the Waikato*, research report prepared for the Department of Labour.

[58] It should be noted that although there have in many cases been large percentage changes in the numbers commuting between the three cities, these are based on very low figures in 1996 and even in 2006 represent only very small proportions of the overall commuting flows.

[59] For the purpose of this particular analysis, Wellington has been defined to include the four cities within the region (note we also report on commuting to Wellington City separately.

Palmerston North	138	26,985	201
Wellington (4 cities)	750	153	149,061
2006			
Auckland Metro	441,390	105	795
Palmerston North	153	30,111	210
Wellington	849	165	161,430
Growth 1996-2006 (Per cent)			
Auckland Metro	22%	46%	37%
Palmerston North	65%	9%	32%
Wellington (4 cities)	20%	49%	10%

Source : Statistics NZ and Consultant's Analysis

As in the case of the position for the AHT corridor, the commuting flows from the smaller Palmerston North to the larger Wellington are higher than those in the reverse direction. However the flows are less unbalanced than is the position for the AHT corridor with about 210 commuting from Palmerston North to Wellington and about 165 commuting in the opposite direction. The larger flow is about 125 per cent of the smaller one, compared to a typical imbalance of about 1.5 to 2 in Auckland's favour for Hamilton and Tauranga. The importance of Wellington as a place to work appears to be less marked than that of Auckland. The growth in these flows lies between the very high growth rates observed between Auckland and Tauranga and the more modest growth rates between Hamilton and Palmerston North. Notably, more workers commute from Auckland to the four Wellington cities than commute from Auckland to Hamilton and Tauranga combined.

Table 5.6 sets out the commuting flows in 2006 as a proportion of the total workforce in the generating area:

Table 5.6: Commuting Patterns between Palmerston North and Wellington 2006

	Place of work	
Area of residence	Palmerston North	Wellington
Palmerston North	90.2%	0.6%
Wellington	0.1%	97.6%

Note: Commuting flows as per cent of workforce in the generating area.

The flows from Palmerston North to Wellington represent about 0.6 per cent of the workforce resident in Palmerston North but a much smaller proportion of employment in Wellington. The flows in the reverse direction represent a small share of the workforce resident in Wellington. The commuting flow between Palmerston North and Wellington at 0.6 per cent of the resident workforce is somewhat lower than the proportions for the AHT corridor for Hamilton and Tauranga, suggesting a more limited degree of connectivity with Wellington.

Table 5.5 also includes longer distance flows, particularly between Auckland and Wellington. These indicate that there is a significant amount of long distance commuting between the two cities, with the flows broadly balanced and the growth over the period lying between that for Auckland-Tauranga and Auckland-Hamilton

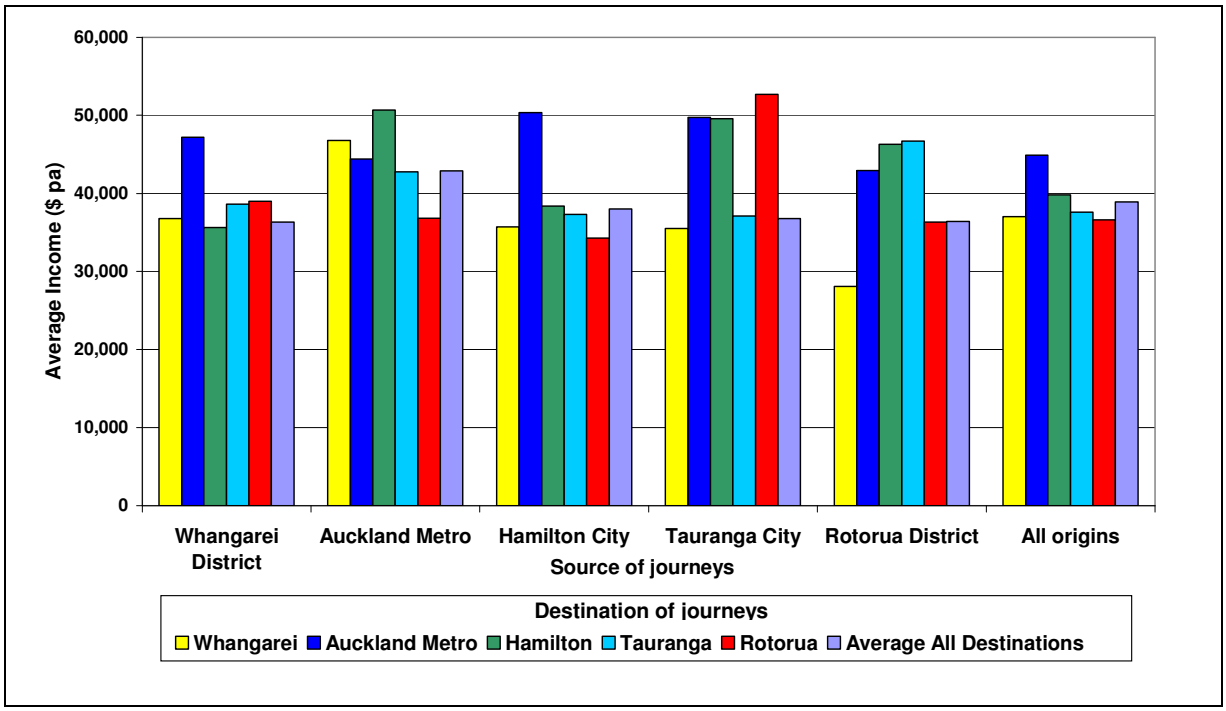
The information on commuting patterns also allows an assessment of the average incomes of those commuting between various destinations in and around the AHT region. The results are set out in Table 5.7 and Figure 5.2 below:

Table 5.7: Average Incomes of Commuters 2006 ($ per year)

Usual Residence	Place of work					
	Whangarei	Auckland Metro	Hamilton	Tauranga	Rotorua	All workers from area
Whangarei District	36,800	47,191	35,600	38,600	39,000	36,300
Auckland Metro	46,787	44,386	50,671	42,745	36,827	42,880
Hamilton City	35,700	50,366	38,400	37,300	34,300	38,000
Tauranga City	35,500	49,755	49,600	37,100	52,700	36,800
Rotorua District	28,100	42,905	46,300	46,700	36,300	36,400
All workers in area	37,000	44,875	39,800	37,600	36,600	38,900

Source : Statistics NZ and Consultant's Analysis

Figure 5.2: Average Income by Destination for Commuting Trips AHT region ($/pa)



Source : Statistics NZ and Consultant's Analysis

Theory would suggest that because commuters travelling away from their place of residence would incur increased costs of travel, relative to travelling to work locally, they would typically be expected to receive higher incomes than those remaining in the area in which they live. Examination of the material in Table 5.7 indicates that this is a particular feature of those commuting to Auckland from Whangarei, Hamilton, Tauranga and Rotorua reflecting the wide range of opportunities in Auckland and the typically higher average incomes achieved there. It is also noteworthy that those commuting to Auckland typically have higher incomes than Auckland residents working in Auckland. Again this would be consistent with the expectation that these long distance commuters receive sufficient compensation for the additional travel costs incurred.

This is also consistent with a view that the higher incomes observed for those commuting to Auckland are likely to reflect the higher productivity of these individuals. From a theoretical perspective, the wage (in a competitive labour market) should reflect the worker's (marginal) productivity.[60] This pattern is more likely to reflect the "economic mobility" of these workers: where their skills, experience and relative scarcity put them in a position to choose where to live and work and allow them to take advantage of lifestyle opportunities. This has an important implication for thinking about the AHT region as an interconnected area. There are highly skilled, productive people living in the satellite cities/areas who may need the market size and hierarchy of Auckland to support/attract their skills. But they live in - and quite possibly bring to - Hamilton or Tauranga their skills

[60] Lewis, G. & Stillman, S. (2005). 'Regional economic performance in New Zealand: How does Auckland compare?' NZ Treasury Working Paper 05/08. Available from New Zealand Treasury website: www.treasury.govt.nz/workingpapers/2005/wp05-08.asp.

and experience through voluntary or part time roles. Over time, this opportunity may to some extent contribute to the more rapid economic development of that area.

For Auckland residents, average incomes of those commuting to Whangarei or Hamilton are higher than those typically earned within the city, but those commuting to Tauranga and also Rotorua achieve on average lower incomes than those remaining in Auckland. Similarly for Hamilton residents, average incomes of those commuting to Auckland are higher than those for workers remaining in the city but lower incomes are achieved for those commuting to Tauranga or Rotorua. Consistent with this picture, for Tauranga residents much higher incomes are earned by those working outside the city.

The final row in Table 5.7 provides indications of the average earnings reported for each of the areas identified. Earnings are highest in the Auckland Metro area at about 15 per cent over the national average, followed by Hamilton about 2 per cent above the average. Tauranga on the other hand has average earnings about 3.5 per cent below the national average and with Whangarei and Rotorua 5-6 per cent below.

In looking at commuting patterns, some of the key features that emerge are:

- In general the key cities in the AHT areas are broadly self sufficient with employment opportunities in the areas being met by workers residing either in the area itself or the adjoining areas. This is an important finding for our study. The level of longer distance commuting between the cities is low. This suggests that any significant labour mobility into or within the AHT region is likely to be facilitated via migration to areas of work rather than via long distance commuting. This possibility is examined in later sections of the report.

- Despite Auckland having a larger pool of workers, commuter movements into Auckland from Tauranga and Hamilton are larger than those in the reverse direction by a factor of 50 to 100 per cent.

- Commuter movements between Hamilton and Tauranga are relatively small, with a larger movement from Tauranga to Hamilton than in the reverse direction. The small numbers commuting between these two cities is probably a function of both limited opportunities and also the perceived difficulty of travel between the two reported in many of our interviews.

- More people commute from Auckland to Wellington than commute from Auckland to Hamilton and Tauranga combined.

- The growth of commuting flows has been fairly patchy over the period from 1996 to 2006. There has been strong growth in outbound movements from Auckland to both Hamilton and Tauranga both of which have more than doubled since 1996. There has also been strong growth in the movements from Tauranga to Auckland which grew by 124 per cent over the period, but the level of commuting from Hamilton to Auckland has been more muted at about 30 per cent. Between Hamilton and Tauranga there has been a strong growth in movements to Hamilton but a decline in movements to Tauranga.

Overall, while journeys into Hamilton from Auckland and Tauranga have grown strongly there has been relatively little change in outbound movements, possibly reflecting the

growth in employment in Hamilton which has absorbed the growth and the skills of the workforce resident in and around the city, and indeed has encouraged the growth of commuting into the city.

Theoretically commuters between the three cities should earn higher wages than those remaining in the area where they reside to compensate for the increased costs of travel, although for the longer distance flows, the small numbers mean that the position may not be so clear. At the aggregate level, this tends to be true for movements between cities in adjoining regions although this is not the case for movements between Hamilton and Tauranga where the average income of commuters is lower than those remaining in Hamilton. This may explain the limited growth in this movement over time.

5.2.1 Additional information: Transformation of Waikato labour markets

An analysis of labour market areas in the Waikato carried out by Barrett et al (2009) provides a useful picture of the changing commuting patterns in the Waikato between 1991 and 2006.[61] The report found that over this time a noticeable change took place as these labour markets evolved. In 1991 31 distinct labour markets were identifies whereas, by 2006 this had reduced to just 14.[62] Although Hamilton City dominated employment in the Waikato in 1991 the high number of labour markets reflected a fragmented labour market with localised employment opportunities and relatively little commuting into Hamilton from external areas. Employment relied strongly on co-locational relationships with specific industries such as electricity generation at Arapanui, Forestry in Tokoroa and dairying in Morrinsville. Additionally, smaller rural service towns such as Otorohanga provided local employment. The authors characterised the Waikato region as having limited rural-urban commuting and many small, self contained labour market areas.[63]

By 2006 a different picture had emerged. The 14 distinct labour markets observed in 2006 were all located around a relatively large urban area of industry, with Hamilton's dominance increasing markedly.[64] Suggested trends which may have influenced this transformation include improved transport accessibility, increasing house prices (particularly in Hamilton) and growing centralisation of industry. The result has been a general increase in the length of commuting trips with fewer, larger labour market areas. In general labour market areas in proximity to larger urban areas grew at the expense of labour market areas associated with rural areas. Most noticeable, growth was centred on Hamilton and the northern Waikato region. Barrett et al (2009) found that by 2006 Hamilton "exhibited the characteristics of a major centre and has economic drivers that are quite different from those in the region's rural labour market areas."[65]

This information provides a useful complement to our analysis and paints a similar picture to what would be expected within the analytical framework we are employing.

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[61] Barrett et al, 2009, Ibid. p11.
[62] Barrett et al, 2009, Ibid. p9.
[63] Barrett et al, 2009, Ibid. p11.
[64] Barrett et al, 2009, Ibid. p13.
[65] Barrett et al, 2009, Ibid. p13.

The dual attractions of proximity to Hamilton and/or the Auckland region act like magnets in attracting workers to higher paid and more specialised job opportunities.

5.2.2 Interviewee comments - commuting

Comments from interviewees relating to commuting travel patterns between the three cities included:

- "Few staff commute from Tauranga (to Hamilton)" …"too far for commuting"
- Auckland seen as more practical for commuting to/from Hamilton
- "Road to Auckland (from Hamilton) is critical"
- "Commuting to Hamilton from Auckland is becoming important for Hamilton"
- "Local Tauranga roading network is very good."
- "Hamilton wants Auckland – Hamilton passengers rail to be developed."

In general, the responses we received from interviewees confirmed the patterns observed in the data, which is that few people find commuting between the cities to be a desirable proposition, although the Auckland-Hamilton journey would be perceived as being the easiest trip.

5.3 Business travel patterns

Information has been obtained from the Auckland Regional Council on business travel patterns between Auckland and other areas. This is derived from surveys undertaken as part of the development of the upgraded regional transport model. As a result, while it may not be directly comparable with the information on commuting flows set out above which is derived from Census data and which relates to the Auckland Metro area rather than the Auckland Region as a whole, it does provide a useful source of information on the general pattern of business travel patterns.

The patterns of business trip making away from Auckland estimated from the surveys are set out in Table 5.8. It should be noted that these relate to trips by road and so would exclude any movements by air which may start to become important for movements to destinations further away, particularly Tauranga. The importance and possible size of the air travel market in the corridor is considered later in this report.

Table 5.8 Estimated Daily Business Trips from Auckland to External Regions*

Region	TLA (included in regional total)	Total trips	Per cent of daily total
Northland		**78**	**12%**
	Whangarei	32	5%
Waikato		**362**	**56%**
	Hamilton	183	29%
	Waipa	12	2%
	Waikato	63	10%
	Thames	12	2%

	Taupo	4	1%
	Hauraki	15	2%
	Matamata	41	6%
	S Waikato	2	0%
	Franklin	29	4%
BOP		**134**	**21%**
	Tauranga	96	15%
	Rotorua	15	2%
	Opotiki	7	1%
	Whakatane	11	2%
	WBOP	6	1%
Gisborne		10	2%
Taranaki		13	2%
Manawatu		15	2%
HB		10	2%
Wellington		16	2%
Other		4	1%
Total		642	100%

*Source: ARC and Consultant's Analysis *By road, excluding truck movements*.

The figures indicate that the main destination for business trips from Auckland is the Waikato region and in particular Hamilton, reflecting its location as the largest city in the vicinity of Auckland. The number of business trips to Tauranga is about half that to Hamilton, reflecting the smaller size of Tauranga and its increased distance away from Auckland. It is worthy of note that the numbers of business trips to Rotorua are relatively small in relation to those for Tauranga despite its size and distance to Auckland suggesting that there is a different degree of connectivity for these two cities.

While there are issues in comparing the numbers of business and commuting trips, since they are derived from different sources of data, comparing the figures in Table 5.1 and Table 5.8 suggests that for movements between Auckland and Hamilton and Tauranga, business trips are at about 50 per cent of the numbers commuting. For the smaller cities of Whangarei and Rotorua however, the share is much smaller at about 10 per cent of the commuting flows, suggesting a lower level of interaction between the business activities in these centres. Data was also sought on business travel generated between Waikato and Bay of Plenty regions. However the information available was unfortunately fairly limited and was not incorporated into the analysis.

5.3.1 Interviewee comments – business travel

We asked respondents about the degree to which staff physically move between locations to serve out of area needs. Responses included:

- "Staff travel from Tauranga to Hamilton once a month to visit clients but tend to work electronically and keep in regular contact with Hamilton colleagues."
- "Some staff move between Hamilton/Tauranga or vice versa. Will move for the week and stay in location rather than commuting daily as too far to drive."

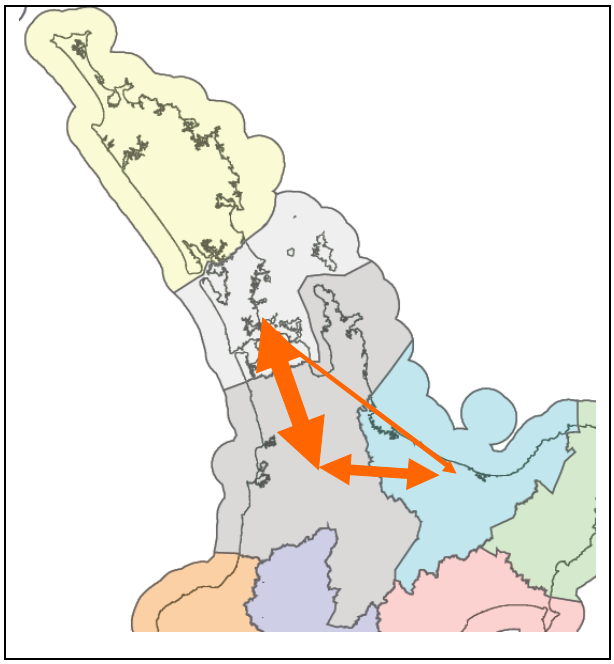
- "From Tauranga it takes 1.5 hours to Hamilton, 3-4hrs to Auckland depending on Auckland traffic. Auckland too far for one day – stay night before. Anything over 1hr getting to far to commute."
- "3 hour round trip to Hamilton (from Tauranga) too far and expensive for regular journeys – use video conferencing where possible."

5.4 Freight Movements in the AHT Corridor

The assessment of the pattern of freight movements within the AHT region has been derived from the results of the National Freight Demands Study (NFDS). This took as its base the position in 2006-07 and while there have been changes in this position in subsequent years, there are no comprehensive statistics available on these. Typically current levels of freight movements in aggregate are broadly similar to those recorded for that study and so the position for 2006-07 has been taken as a reasonable base for the current position. It should also be noted that the broad statistics on freight movements relate to a regional level and assessment at a more detailed level therefore requires a degree of interpretation.

The figures in the NFDS have been built up from the detailed consideration of the volumes and patterns of flows of a range of key commodities. Using control totals for the freight task as a whole, the flows identified for the key commodities, which represent about 65 per cent of the total, were expanded to give overall estimates of the patterns of movement of freight. As a consequence, in presenting estimates for the freight task in the AHT region, it should be noted that some relate to the identified commodities only and others relate to the freight task as a whole. Figure 5.3 depicts these movements:

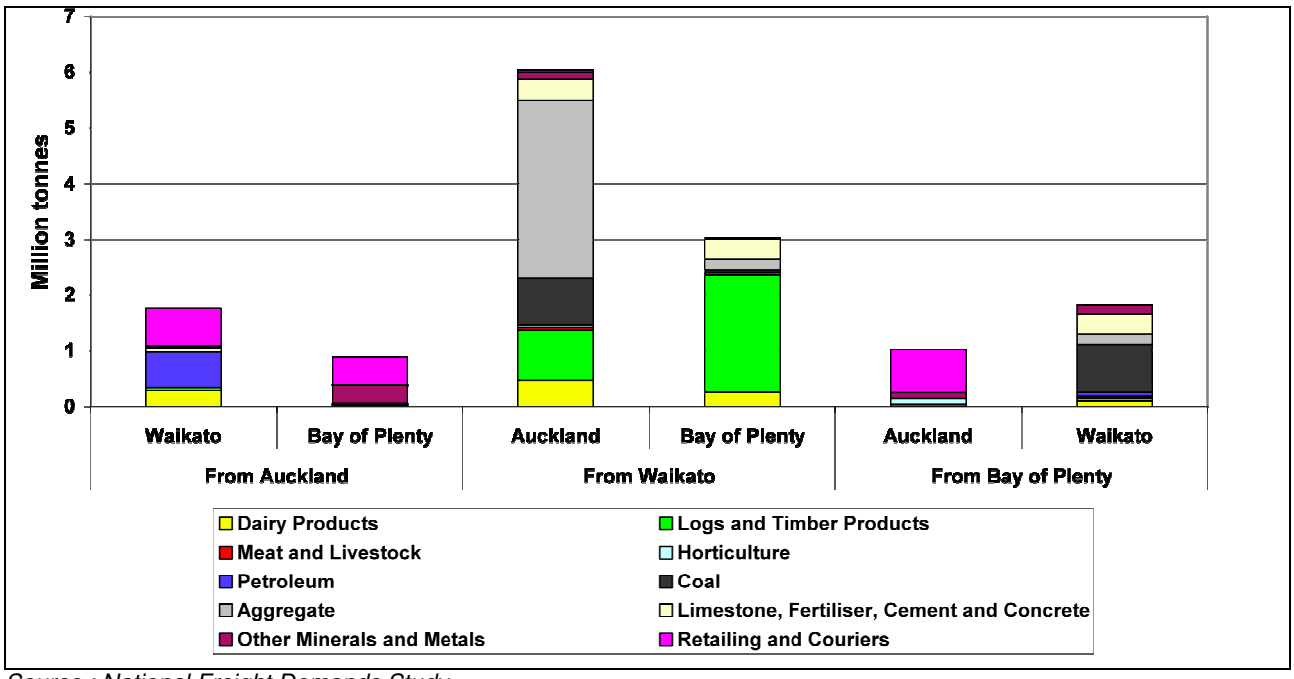
Figure 5.3: Broad Patterns of Freight Movements AHT region 2006-07*



**Thickness of arrows represents proportionate scale of flows between regions.*

Within the AHT region, the highest flows are between Auckland and Waikato and Waikato and Bay of Plenty, with flows between Auckland and Bay of Plenty being fairly small. The breakdown of the total identified flows by commodity is set out in Figure 5.4:

Figure 5.4: AHT Inter-Regional Flows 2006-07: Identified Commodities only

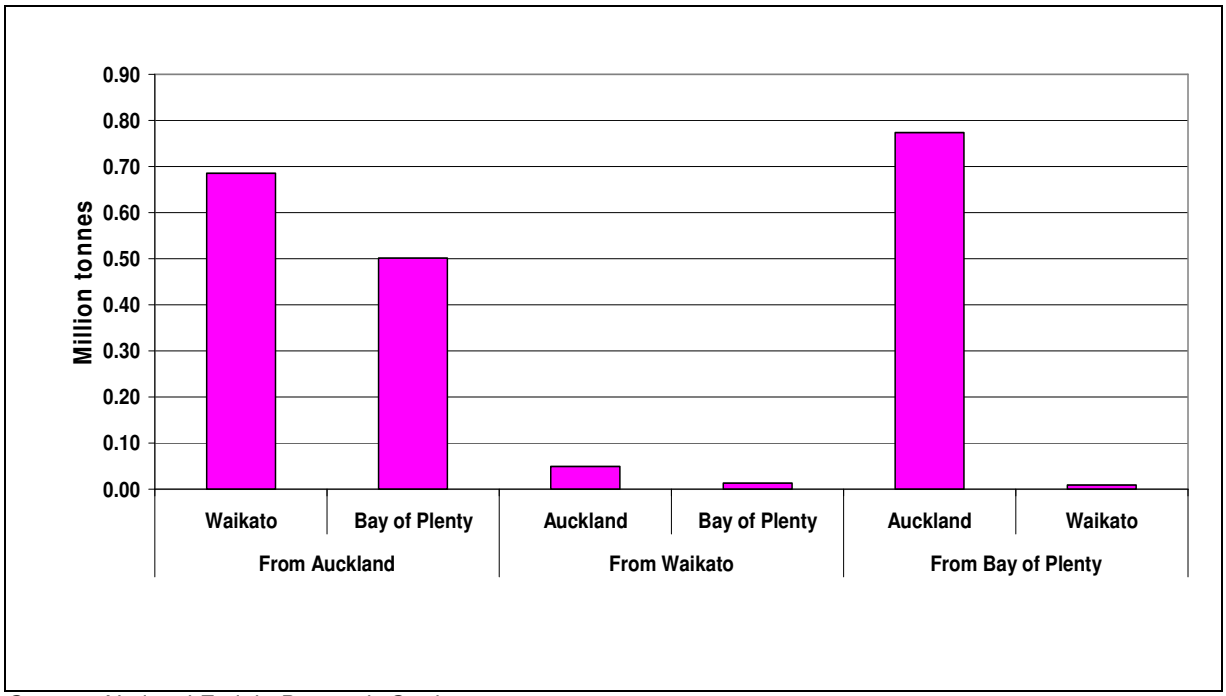


Source : National Freight Demands Study

Figure 5.4 demonstrates the importance of the movement of basic commodities between the regions in the AHT corridor, particularly the movement of aggregates, coal and timber products from Waikato to Auckland and timber products to Bay of Plenty. Other major flows of basic commodities include coal from Bay of Plenty to Waikato and petroleum products from the pipeline terminal at Wiri to Waikato.

Included in Figure 5.4 are flows of dairy products from Waikato to Auckland and Bay of Plenty. While to some degree these are generated at a range of locations in the Waikato, a large proportion of the traffic is centralised on Fonterra's facility at Crawford Street in Hamilton. To that extent this movement is related to the city of Hamilton rather than the surrounding rural area and demonstrates the way in which activities in urban areas can play an important part in the supply chains for fairly simple agricultural products. However possibly more important for the flows between the cities are the movements of retail and consumer goods and the details of these are set out in **Figure 5.5**:

Figure 5.5: AHT Inter-Regional Flows 2006-07: Retail and Consumer Products

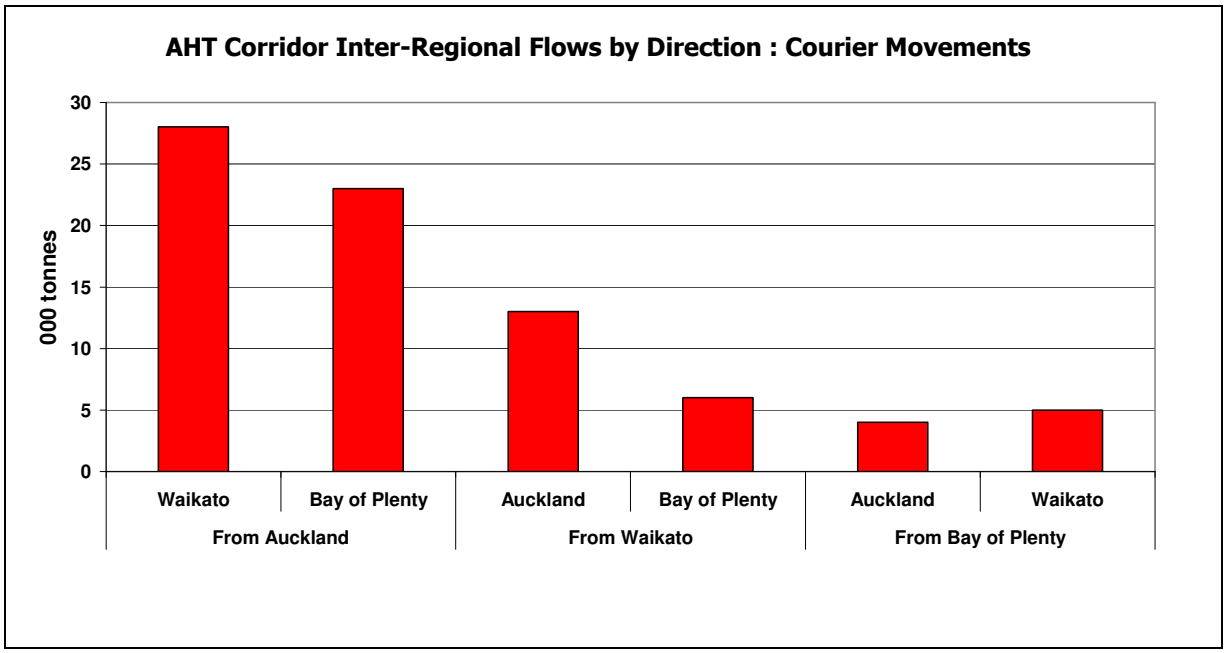


Source : National Freight Demands Study

Figure 5.5 demonstrates the importance of Auckland as the key distribution centre for retail and consumer goods, and also the importance of Bay of Plenty and in particular the Port of Tauranga as a potential source of imported goods to be redistributed by facilities in Auckland. The volumes of inter-regional movements generated in the Waikato are small as are movements from Bay of Plenty to Waikato.

The final analysis has considered the movements of courier freight between the three regions and this is set out in Figure 5.6. To some extent courier movements are manifestations of high level interactions between areas with the movements of documents or specialised manufactured products.

Figure 5.6: AHT Inter-Regional Flows by Direction 2006-07: Courier Movements



Source : National Freight Demands Study

Again this confirms the dominance of the Auckland region as a generator of courier traffic. Movements back from the Waikato and particularly Bay of Plenty are relatively small, as are the movements between these two regions.

5.5 Airports and Air Transport in the Study Area

Airports and air transport potentially play a significant role in the movements of passengers between Auckland and Hamilton and Tauranga. The area is served Auckland International Airport, primarily domestic airports at Rotorua and Hamilton with some international services (2 per week from Rotorua and 4 per week from Hamilton) and the regional airport at Tauranga.

Auckland airport is the main international gateway for New Zealand and an important hub for domestic travel. In the year to the end of August 2010, the airport handled 7.5 million international passengers and about 6.1 million domestic passengers. The airport is also the main international air freight hub for New Zealand and in 2010 carried about 86 per cent of airfreight by weight and 87 per cent by value. The international airfreight through the airport also accounted for 16 per cent of all international trade in commodities by value, making it a major international port for the country as a whole.

Air transport links within the study area also provide for a range of movements including:

- direct movements between Auckland and Tauranga, Rotorua and Hamilton;
- parts of more complex domestic journeys to or from origins and destinations outside the study area; and
- parts of longer international flights.

For this latter group Auckland offers a very wide range of destinations served directly and provides a reasonable level of international accessibility to and from the study area. While there is some direct accessibility from Rotorua and Hamilton, the frequencies of these flights are low.

There is only limited information on the movements of air travellers in between the three cities. Information from the SABRE database used by travel agents suggests about 130,000 trips per year between Auckland and Tauranga and 35,000 trips per year between Auckland and Hamilton. These comprise point to point journeys and trips that are part of longer journeys.

While there is some data on this from the SABRE data base and from Air New Zealand, there appear to be differences between these, and in addition the entry of budget carriers into the market where separate ticketing is necessary for onward journeys may complicate the analysis. The most recent figures suggest that for Tauranga movements, about 45-50 per cent of flights are for point to point movements with the balance transferring to or from other flights at Auckland, using this to access a wider range of domestic or international destinations. For flights to and from Hamilton, point to point movements are reported to account 15-30 per cent of the total, with the main role of the services to provide onward connections from Auckland. As discussed above, this and the equivalent figure for Tauranga possibly include trips transferring to other domestic carriers and so may overestimate the size of the movements wholly within the study area.

The numbers travelling by air between Auckland and Hamilton can be compared with the numbers commuting of about 0.5 million journeys per year and the number of business trips of about 100,000 journeys. Movements by air for all purposes (including leisure as well as business use) therefore represent 10 per cent or less of the total business travel between the two cities. Given the proximity of the two cities this small share is to be expected.

For Tauranga the distances are greater and from the results of the interview surveys the journey appears to be on the cusp of the balance between road and air travel. The estimated point to point air movements to and from Auckland of 50-55,000 per year can be compared with the numbers of commuting journeys of probably about 100,000 per year (assuming an average of 2 return trips per week) and the numbers of business trips of 50,000 per year. Again there is no information available on the possible breakdown by journey purpose of these point to point trips, but for the market overall, business trips account for about 35-45 per cent of the total and may account for a higher proportion of the shorter distance trips directly between Tauranga and Auckland. For Tauranga air travel may therefore represent 25 per cent or more of the business market supporting the links between Auckland and Tauranga, with a total number of journeys of about 60-75,000 journeys per year. Growth in air travel has also been strong particularly for the services to and from Tauranga. In both cases the share of point to point travellers has been fairly stable.

Auckland airport also provides an important connection between Hamilton and Tauranga and a range of international destinations. While some of these will be accessed by flights from these two cities, with the numbers of international through passengers representing about 10 to 20 per cent of the total, for some of these movements, particularly from Hamilton access to Auckland airport may be more convenient via a

land-based mode rather than by air. Information supplied by Auckland Airport suggest that there may be about 0.25 million trips from the Hamilton area travelling by road to Auckland Airport and about 0.1 million trips from Tauranga. These respectively appear to be much larger than the numbers flying from Hamilton and also of a similar order of magnitude to the numbers travelling by air to and from Tauranga. They demonstrate the importance of Auckland airport as a gateway to onward travel for residents and visitors to Hamilton and Tauranga rather than Auckland being an important destination in its own right.

Specific comments from interviewees relating to air transport included:

- "Hamilton airport doesn't need to be international. Better to have good links to Auckland"
- "Hamilton is patriotic about its airport. Domestic links are important and want to keep international flights. It has reliability issues in winter with fog."
- Tauranga Airport – can be effective for international travellers – saves check in at Auckland."

5.6 Summary

Briefly, our analysis in this section points to the conclusion that the level of longer distance commuting between the cities is low and in general the three cities are self sufficient with respect to employment opportunities. This is an important finding as labour mobility is one aspect that would be expected to be observed within a functioning city system. This also suggests that any significant labour mobility into or within the AHT region is likely to be facilitated via migration.

For the business trips the main destination from Auckland is the Waikato region and in particular Hamilton, reflecting its location as the largest town in the vicinity of Auckland. The number of business trips to Tauranga is about half that to Hamilton, reflecting the smaller size of Tauranga and its increased distance away from Auckland. The numbers of business trips to Rotorua are relatively small in relation to those for Tauranga despite its size and distance to Auckland suggesting that there is a different degree of connectivity for these two cities.

From a freight perspective there are important linkages between the three city-regions. The highest freight flows are between Auckland and Waikato and Waikato and Bay of Plenty, with flows between Auckland and Bay of Plenty being fairly small. However, freight movements in volume terms are dominated by the basic commodities such as aggregate, liquid milk and logs and timber products. These are typically generated in rural areas and may therefore not have any significant direct connection with the higher value added products typically generated by the cities.

Auckland is the key distribution centre for retail and consumer goods and the Bay of Plenty and in particular the Port of Tauranga is a source of imported goods to be redistributed by facilities in Auckland. Within the AHT region, the highest flows of courier traffic are between Auckland and Waikato and Waikato and Bay of Plenty, with flows between Auckland and Bay of Plenty being relatively small.

Air transport is important in the AHT area both for providing connections to and from Auckland for point to point movements and also for the use of Auckland International Airport as the gateway to a wide number of destinations particularly those served by international flights and this has been growing fairly strongly. Between Tauranga and Hamilton and Auckland business travel by air supplements that identified for land based modes and for Tauranga may represent up to 25 per cent of the total business market However although there is only limited data available, the presence of Auckland as a major international and domestic gateway served from Hamilton and Tauranga by both road as well as internal flights may have a greater impact on economic development than the use of air for point to point movements between Auckland and the other two cities.

6 Population Trends and Migration Patterns

6.1 Introduction

In this section we examine trends in population growth and then consider migration patterns. Migration within the corridor has a range of potential impacts on economic growth and development. To some extent, as noted in Section 5, it complements the effects of commuting allowing a better match to be achieved between the skills available and the skills required especially where these are at such a distance that regular commuting becomes difficult or impossible over the longer term. Migration may also reflect lifestyle choices with people choosing to live in a more desirable location to meet a wider set of personal objectives (e.g. retirement). However, whether or not migrants work at their new locations they will contribute to overall levels of economic activity by their expenditure and the expenditures that third parties such as local and central authorities spend to support them through areas such as pensions, health care etc.

In many instances migrants will retain links with their previous area of residence and activities and services within these with the potential for increased flows of funds between the two. In addition the movement of migrants from one area to another will potentially change house prices, reducing them in the area that they vacate and increasing them in the area to which they relocate. Persons for example migrating from say Auckland to Tauranga will reduce the pressure on the housing market in Auckland and increase the pressure in Tauranga. If the person is retiring, the movement away from Auckland will help create an opportunity for a new worker who may be more productive and whose addition to the labour force will increase total output. If the housing market is under less pressure in Tauranga the impact may be smaller than that experienced in Auckland.

6.2 Population

Table 6.1 provides us with the total population numbers for the AHT region for each of the time points we examine. [66]

Table 6.1 Population of the AHT regions, 1996-2009

Area	Population				%pa growth	
	1996	2001	2006	2009	1996 to 2009	2006 to 2009
Auckland Metro	928,000	1,005,000	1,126,000	1,178,000	1.9%	1.5%
Hamilton	110,000	116,000	129,000	135,000	1.6%	1.5%
Tauranga	78,000	91,000	104,000	109,000	2.6%	1.6%
New Zealand	3,618,000	3,737,000	4,028,000	4,155,000	1.1%	1.0%

Source: BERL, Statistics NZ

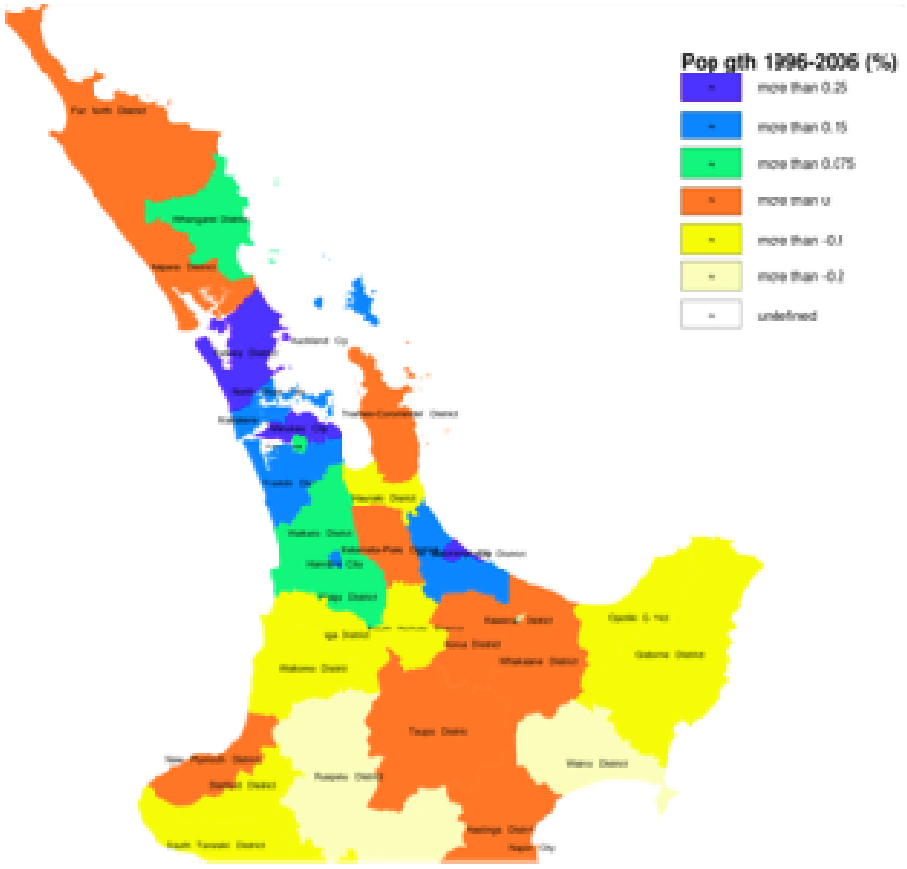
Of interest here is the fact that over the 13 years from 1996 to 2009, the population of the AHT region has been growing at a much faster annual rate than the national

[66] The comparison regions we will use have been selected to be of a similar population size, and are detailed in Table A2.2 in Appendix 2.

average. This trend has slowed over the last 3 years from 2006 to 2009, but is still particularly strong. Overall, between 1996 and 2009 New Zealand's population increased by 537,000 people of which 56 per cent of the increase (300,000 people) was accounted for by Auckland and 66 per cent by the AHT region (356,000 people). Comparing the three city regions, in absolute numbers the growth of population in Metropolitan Auckland dominates. However, Tauranga's population growth rate exceeded Auckland's rate between 1996 and 2006. From 2006 onwards as growth in Auckland and Tauranga slowed all three cities continued to grow at approximately similar rates. Importantly, Auckland, Hamilton and Tauranga have the highest population growth rates of all New Zealand cities over the time period from 1996 to 2009.

A characteristic of New Zealand over this period has been the relatively high population growth of the main towns within regions compared to the growth of the more rural components of the regions and this is set out in Figure 6.1 for the Upper North Island over the period from 1996 to 2006.

Figure 6.1 North Island Population Growth Comparison 1996-2006 (%)



Source: Consultants Analysis

The position around Auckland is complex but the area as a whole has very high growth with Manukau and Rodney having the highest growth rates. However, given the relative sizes of the populations within the cities and districts of Auckland the absolute growth in population is highest in Auckland City and Manukau whilst Rodney can be considered to

act as a dormitory area for the more developed parts of the regions, particularly North Shore and Auckland City. For the other regions including Northland, Waikato, BOP and Taranaki, growth in the area is dominated by the main city in that region and its immediately surrounding areas. This is consistent with New Zealand's position as a highly urbanised society.

6.3 Overall migration patterns between the three cities[67]

The information available from the 2006 Census allows the place of residence five years earlier to be determined in conjunction with the age and educational attainment of the migrant, and this information is considered in the remainder of this section and in more detail in Appendix 1. The overall position for three main centres of Auckland Metro, Hamilton and Tauranga are set out in Table 6.2. This also includes the numbers relocating from other areas in New Zealand and also the numbers locating from overseas.

Table 6.2 Migration Patterns between Auckland Metro, Hamilton and Tauranga 2001-2006 Residents over 15 in 2006

Place of Residence in 2006	Place of Residence in 2001					
	Auckland	Hamilton	Tauranga	Other NZ	Overseas	Total 2006
Auckland Metro	614181	3549	2073	49323	133467	802593
Hamilton	2859	61881	1140	16809	10521	93210
Tauranga	3675	1503	51615	13704	5985	76482

Source: Statistics NZ

The key features revealed by the data include:

- The single largest source of inward migration for Auckland is from overseas. For Hamilton and Tauranga it is from 'other NZ' locations.
- Inward migration has been a significant driver of population growth in Hamilton and Tauranga with about a third of the residents over 15 of each city in 2006 having relocated from outside the city over the preceding 5 years.
- For Auckland the proportion who have relocated is smaller at about 24 per cent of the total in 2006, but given the size of Auckland the total number of migrants is substantially larger than those attracted to Hamilton and Tauranga.
- Auckland is a net attractor of population from Hamilton with an inflow of about 3,500 against an outflow of 2,900.
- On the other hand, Tauranga is a net attractor of residents from Auckland with an inflow of 3,700 against an outflow to Auckland of 2,100.

[67] Appendix 1 provides a range of detailed statistics on migration patterns to and from the three cities.

- The net inflow to Tauranga of 1,600 migrants from Auckland over the five years from 2001 represented about 2 per cent of the total population of Tauranga in 2006.
- Tauranga is also a small net attractor of residents from Hamilton with a movement of 1,500 to Tauranga and 1,100 in the reverse direction, a net gain to Tauranga of 400 people.
- There were very large inflows from overseas between 2001 and 2006, representing about 17 per cent of residents of Auckland in 2006, 11 per cent of Hamilton residents and 8 per cent of the residents of Tauranga. For Auckland these migrants amount to around 70 per cent of those migrating to the area, for Hamilton about 33 per of those migrating to the city and for Tauranga about 25 per cent.
- In all three cities, therefore, movements from 'other parts of NZ' and overseas represent a substantial proportion of those migrating to the areas, and are much larger than the movements between the three cities. The effects of the linkages acting via migration between the three cities are therefore found to be relatively modest in comparison to these wider movements.

6.4 Profile of migrants to Tauranga

An important aspect of migration that is worth addressing is the profile of new migrants attracted to Tauranga. The strong perception is that Tauranga is a location favoured by retirees. However, our analysis reveals a rather different picture.

Table 6.3 Migration to Tauranga from Areas over the period 2001 to 2006 by Age of Migrant

Age	Residents who lived in Tauranga in 2001 and 2006	Migrants from		
		Auckland	Hamilton	Overseas
15-19 Years	8.4%	4.6%	6.8%	8.1%
20-24 Years	6.7%	5.1%	13.6%	6.9%
25-29 Years	6.5%	10.2%	15.0%	14.1%
30-34 Years	7.8%	14.0%	11.4%	18.6%
35-39 Years	8.9%	13.6%	10.6%	15.3%
40-44 Years	9.2%	10.4%	7.2%	10.9%
45-49 Years	8.8%	6.5%	6.6%	7.5%
50-54 Years	7.9%	6.2%	5.8%	5.4%
55-59 Years	7.4%	6.6%	7.0%	3.9%
60-64 Years	6.4%	6.6%	5.0%	3.7%
65 Years and Over	22.0%	15.9%	11.0%	5.7%
Total	100.0%	100.0%	100.0%	100.0%

Source : Statistics New Zealand and Consultants Analysis

The table illustrates that Tauranga does have a relatively higher proportion of residents over 60 years of age (22.4 per cent of the total population in 2006) compared with Auckland (13.2 per cent) and Hamilton (13.8 per cent) and New Zealand as a whole of about 17 per cent. However, what is interesting is that migrants to Tauranga between 2001 and 2006 were predominantly in the 20 to 45 years age bracket. For example, 53.3

per cent of migrants from Auckland to Tauranga during this period were in this age bracket compared to 22.5 per cent being over 60 years of age. In our interviews it was emphasised that Tauranga is seen as a lifestyle location which is possibly a factor behind this trend, both for mid-career moves and for retirement. So too maybe the lure of relatively affordable housing, compared with Auckland. The levels of education for the different age groups are set out in Table 6.4:

Table 6.4 Levels of Educational Attainment Tauranga Residents 2006 by Residence in 2001

Source of Migrants	Total in 2006	Level of Educational Attainment in 2006					
		No Qualification	Level 1-4 Certificate	Level 5-6 Diploma	Level 7 and above	Not Elsewhere Included	Total Defined
Tauranga residents remaining from 2001	51615	26.8%	48.0%	9.8%	8.1%	7.3%	100.0%
Auckland	3669	18.9%	47.2%	11.2%	17.7%	5.0%	100.0%
Hamilton	1509	17.1%	46.9%	9.1%	22.5%	4.4%	100.0%
Overseas	5979	9.3%	51.4%	10.8%	23.1%	5.4%	100.0%

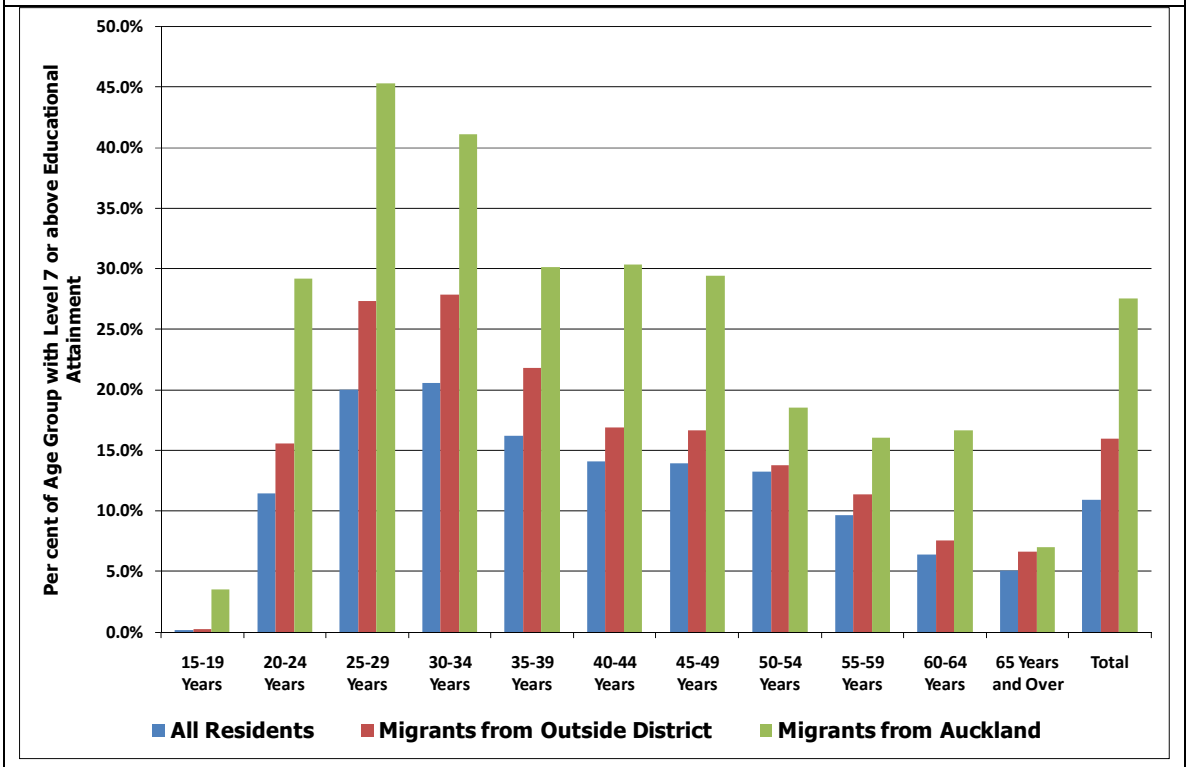
Source : Statistics New Zealand and Consultants Analysis

For each of the groups of migrants into the Tauranga area, the level of educational attainment is much higher than that for those who were resident in the area in 2001. Migration therefore potentially contributes to increasing the levels of educational attainment in the area, although the scale of this is dependent on the opportunities that are available.

Finally given the strong perception that Tauranga is characterised as having large numbers of retirees with relatively low educational attainments an examination has been undertaken of the breakdown of educational attainment by age for all residents of Tauranga in 2006, all migrants and migrants from Auckland and the results are set out in Figure 6.2:

Figure 6.2

Educational Attainment by Age Group in Tauranga 2006



Source : Statistics New Zealand

Migrants from Auckland to Tauranga and from other areas to Tauranga have relatively high levels of educational attainment compared to Tauranga residents, although the level of attainment is low for the group over 65. This age group represents a relatively high share of the population. Residents aged over 65 represent about 22 per cent of the total population over 15, although the share of this age group in migrants is smaller but still fairly large at about 15 per cent. However the levels of educational attainment for migrants to Tauranga were typically lower than those for other cities, again possibly reflecting the shortage of high level opportunities in the city.

6.5 Summary of key findings

An examination of the migration patterns between the three cities of Auckland, Hamilton and Tauranga reveals a number of useful findings. Firstly, while there is a significant level of migration affecting the three cities, the volume of migration between the cities represents a relatively small part of the overall populations of each and, most importantly, a relatively small part of the flows of migrants into the cities.

For Tauranga in 2006, migrants from outside the area represented about 37 per cent of the population over 15, or about 30,000 persons. Of these, migrants from Auckland Metro amounted to only about 3,700, or 4.5 per cent of the population. This represents only 12 per cent of the total migrants resident in Tauranga. Migrants from Hamilton to

Tauranga amounted to 1,500 or around 1.8 per cent of the population, which equated to around 5 per cent of total migrants. At the same time, migrants from overseas amounted to about 6,000 people or about 8 per cent of Tauranga's population or 20 per cent of total migrants. The migrant group was actually larger than the flows from Auckland and Hamilton combined.

For Auckland the level of migration from outside the area represented approximately 23 per cent of the population over 15 years old in 2006, a lower proportion of the total population when compared with Tauranga. Of these migrants, about 70 per cent have arrived in Auckland from overseas while those arriving in Auckland from Hamilton and Tauranga are small at about 2 per cent and 1 per cent of total migrants, respectively.

For Hamilton migrants moving into the city over the period from 2001 to 2006 represent about 33 per cent of the 2006 population over 15 and of these migrants, about a third (representing about 10 per cent of the total population) were from overseas, 9 per cent were from Auckland and 4 per cent were from Tauranga.

Typically, movements from local areas were relatively high for the younger age groups, up to 29 or 34, with significant movements out from each of the three cities. Local migration was also sometimes important in the above 65 age group particularly for flows into and out of Tauranga.

Levels of educational attainment (in terms of the proportion of people with Level 7 qualifications or above) were typically higher for migrants to Tauranga than for the existing population of the area. However, these levels of educational attainment were lower than those recorded for movements to other cities, again possibly reflecting the shortage of high level opportunities in the city.

7 Analysing the economic structure of each city-region

7.1 Scope

In this section we examine the economic performance and structure of the three cities and draw comparison between the three cities and with other New Zealand cities to assist with our analysis of whether a city system can be observed to be emerging within the AHT region. Following on from the discussion in Section 2 a city system can be defined as:

> *"the sites of dense masses of interrelated economic activities that also typically have high levels of productivity by reason of their jointly- generated agglomeration economies and their innovative potentials."*[68]

Our analysis of the economic structure of each individual city-region includes consideration of the location of different components of sectoral supply chains within the region and reasons for the location, type/size of firms plus broader measures of economic performance.

Specifically, we have examined changes in structural composition by comparing data from 1996, 2001, 2006 and 2009. These have been assessed in terms of total employment, total GDP and average productivity and economic composition. From this economic relationships within sectors have been traced to create a picture of the three city economies and their possible inter-relationships. We also rely on the responses to our stakeholder interviews to assist in developing our understanding of the economic structure of the region.

7.2 Overview of the AHT Region

To begin, we provide an economic snapshot of the AHT city–regions. Table 7.1 below shows the total employment measured in terms of Full Time Equivalents (FTEs), total GDP and average productivity (GDP per FTE) for the 2006 and 2009 years for the three city-regions.[69] The table provides us with a good general overview of each region's economy.[70]

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[68] Scott, A.J. and Storper, M., 2003, 'Regions, Globalization, Development', *Regional Studies,* Vol. 37: 6&7, Pp 579-593. p7

[69] This overview covers only the AHT region. Table A2.1 in Appendix 2 provides a more detailed table that also containing relevant data on all the regions we are using as comparator regions.

[70] It should be noted that the figures for employment are derived differently to the figures set out in Section 5 which are derived from the responses to from the Census and so there are differences in the estimates which result.

Table 7.1 Overview of AHT and comparator economies 2006 and 2009

	2006	2009	%pa growth 2006 to 2009
Employment (FTEs)			
Auckland Metro	555,281	568,776	0.8%
Wider Auckland[71]	60,763	60,869	0.1%
Hamilton	67,740	69,606	0.9%
Tauranga	44,850	46,187	1.0%
New Zealand	1,808,677	1,866,747	1.1%
Value added or GDP ($2009m)			
Auckland Metro	57,650	59,811	1.2%
Wider Auckland	5,707	5,531	-1.0%
Hamilton	6,526	6,719	1.0%
Tauranga	4,404	4,481	0.6%
New Zealand	178,702	185,554	1.3%
Productivity (GDP/FTEs)			
Auckland Metro	$103,821	$105,157	0.4%
Wider Auckland	$93,929	$90,868	-1.1%
Hamilton	$96,336	$96,529	0.1%
Tauranga	$98,185	$97,014	-0.4%
New Zealand	$98,803	$99,400	0.2%

Source: BERL, Statistics NZ

Firstly, the table emphasises the sheer difference in scale between Auckland and the other two cities. The total employment in the Auckland area (Auckland Metro plus Wider Auckland) in 2009 of 639,635 FTEs was over five and a half times greater than total employment in Hamilton and Tauranga combined (115,793 FTEs). Hamilton meanwhile provides for 50 per cent more FTEs than Tauranga. A notable characteristic of Auckland is that employment growth over the period has taken place almost exclusively in the metropolitan area and both value added and productivity in the non-metropolitan areas of Auckland fell over this time. Unsurprisingly, it is metropolitan Auckland driving the region's growth.

Although the scale of the three cities differ considerably, they are similar in terms of their recent employment growth profiles, With 1 per cent growth Tauranga's employment grew slightly more quickly than the other two, at 0.8 per cent and 0.9 per cent respectively, although this was slightly below the growth rate for the whole of New Zealand of 1.1 per cent.

However, the GDP profiles tell a different story, as Tauranga's GDP grew significantly more slowly than both Hamilton and Auckland Metro. Consequently, Tauranga's average productivity fell over the 2006-09 period, while productivity in the other two

[71] Includes those parts of the Auckland region before reorganisation in 2010 excluding the four cities ie Rodney, Papakura and Franklin

cities grew, notably in Auckland, which with an increase of 0.4 per cent of GDP per FTE was growing at twice the rate of New Zealand as a whole over this period.

7.3 Value added (GDP)

Table 7.2 shows the total value added in 2009 (in 2009$s) by industry and region for the AHT cities. The table also gives us the total GDP value in Auckland, Hamilton and Tauranga for each industry as a percentage of the total number of FTEs within New Zealand in each industry. Table A2.4 in Appendix 2 provides more detail by adding the comparator cities.

Table 7.2 Value added by industry and region for the AHT cities (GDP 2009$m)

Value added (GDP $2009m)	Auckland Metropolis	Wider Auckland	Hamilton	Tauranga	New Zealand	AHT (% of NZ)
Primary	250	591	69	125	13,149	7.9%
Primary processing	2,682	369	260	215	13,194	26.7%
Metal and machinery manufacturing	2,192	352	362	161	6,301	48.7%
All other manufacturing	2,523	203	229	144	5,959	52.0%
General construction	931	246	155	137	3,972	37.0%
Construction trades	1,157	288	175	133	4,359	40.2%
Wholesaling	6,509	354	553	332	13,983	55.4%
Retail and hospitality	4,098	499	554	438	14,144	39.5%
Surface transport	1,077	155	94	115	3,961	36.4%
Air transport	931	15	3	10	1,508	63.6%
Services to transport, storage	1,571	69	44	125	3,391	53.4%
Electricity, communications	5,660	165	779	406	15,195	46.1%
Finance and insurance	5,978	239	360	255	13,416	50.9%
Business services	15,256	1,191	1,518	1,089	40,983	46.5%
Arts, sport and recreation	2,164	200	206	129	6,304	42.8%
Government	2,071	195	428	161	9,158	31.2%
Education	1,923	188	268	146	6,127	41.2%
Health Services	2,451	153	592	319	8,881	39.6%
Community Services	387	61	69	41	1,567	35.5%
Total	**59,811**	**5,531**	**6,719**	**4,481**	**185,554**	**41.3%**

source: BERL Regional Database, Statistics NZ

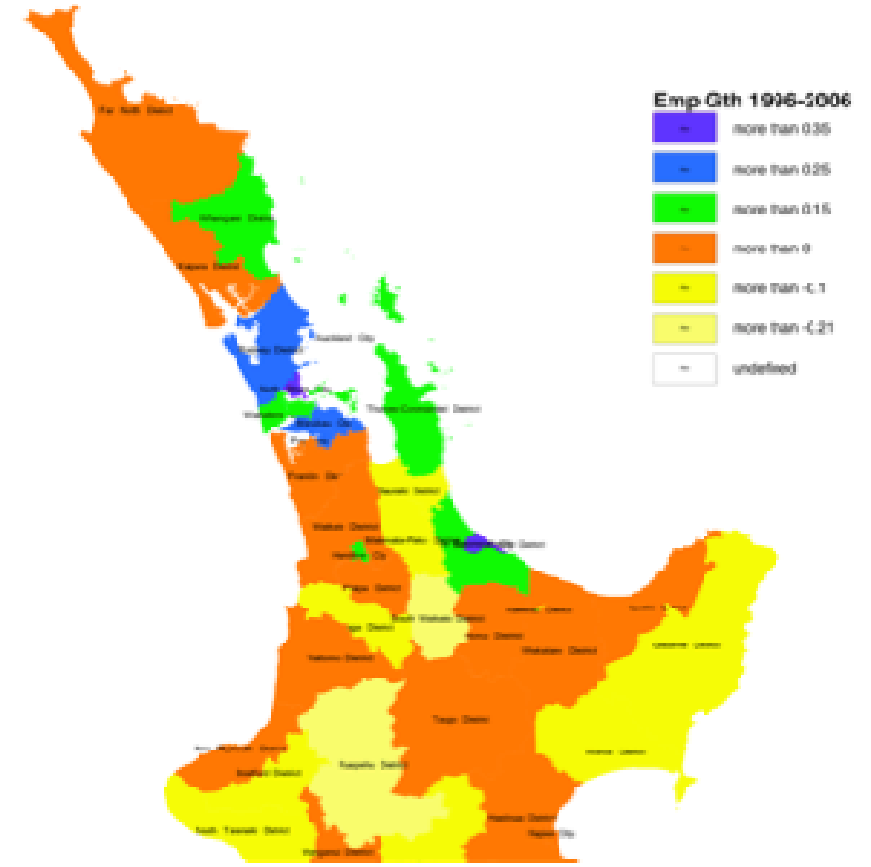
Some of the general points coming from this table are as follows:

- AHT regions account for 41.3 per cent of the total New Zealand GDP, with the bulk in Auckland Metro area. This is a higher percentage than the percentage of total FTEs in AHT regions (40 per cent) possibly indicating the beneficial effect of employment scale and density on productivity in Auckland, but also reflecting the effect of sectoral composition.
- As would be expected, when looking at sectoral composition AHT have very low percentages of GDP in primary industry, with just 8 per cent. This is by far the smallest industry in relation to the national position.
- AHT generates more than 50 per cent of the GDP for five separate industry groups, these are the all other manufacturing; wholesaling; air transport; services to transport, storage; finance and insurance industry areas.

7.4 Employment growth and composition

While the potential for agglomeration effects and an increasing focus on cities has been postulated, we now begin to investigate these through employment effects. Analysis has focussed on the patterns of employment growth in the previous council areas over the period from 1996 to 2006 and comparing growth in the key cities with other areas in their regions. This is set out in Figure 7.1:

Figure 7.1: Employment Growth 1996-2006 by TLA



Source: Consultants Analysis

Employment growth follows a very similar pattern to population growth, being highest in cities and the surrounding areas. While the position in Auckland is complex, it displays generally high employment growth, particularly in the areas where there has been a ready supply of greenfield land for new business development (for example Manukau, Rodney and North Shore). This reflects (and confirms) the more multi-centred (or polycentric) nature of Auckland. For the Bay of Plenty and Waikato, the key cities of Hamilton and Tauranga have noticeably higher employment growth rates than the surrounding areas. This is also a feature over a wider area, with Whangarei in Northland and New Plymouth in Taranaki also displaying higher growth rates than other TLAs in their regions. This analysis so far supports the contention of the increasing focus of population and economic activity within the key cities, as would be expected.

7.4.1 Labour force composition by educational attainment

An analysis of the labour force composition of the three city regions by educational attainment (by highest qualifications) is revealing in that it clearly identifies a difference between Tauranga in comparison to Hamilton and Auckland.

Table 7.3 Educational attainment by city

City	Percentage of Population over 15 with degree or above	Percentage of Population over 15 with PhD
Auckland City	26%	0.9%
North Shore	22%	0.6%
Manukau	12%	0.2%
Waitakere	14%	0.4%
Hamilton	17%	0.8%
Tauranga	10%	0.2%
Wellington	33%	1.4%
Dunedin	18%	1.5%
Palmerston North	17%	1.7%

Source; Statistics NZ

The key observation is that Tauranga's population over the age of 15 is relatively under qualified when compared with the population of Auckland and Hamilton and also when compared with other NZ cities. This suggests a number of possibilities:

- Tauranga attracting older, less highly qualified residents;
- Younger more highly qualified residents leaving to seek employment in other locations; and
- A lack of opportunity to acquire higher educational qualifications in Tauranga.

Overall, it is likely that all three of these factors are contributing towards this outcome. In our interviews respondents from both Hamilton and Tauranga gave a consistent response that the relative lack of tertiary educational opportunities in Tauranga was negatively impacting on the skills level of the workforce. This was seen by respondents as a major constraint to the further growth of skilled, higher income employment in Tauranga.

7.4.2 Labour force composition by industry

Table 7.4 shows the total number of FTEs in 2009 by region and industry. The table shows the main areas of interest, and three comparator areas of Palmerston North, Wellington and Napier-Hastings. The table also gives the total number of FTEs in Auckland, Hamilton and Tauranga for each industry as a percentage of the total number of FTEs within New Zealand in each industry.

Table 7.4 Employment by industry in the AHT cities (FTEs, 2009)

Employment (FTEs, 2009)	Auckland Metropolis	Wider Auckland	Hamilton	Tauranga	New Zealand	AHT (% of NZ)
Primary	3,213	7,043	944	2,104	153,603	8.7%
Primary processing	21,322	2,768	1,931	1,631	99,488	27.8%
Metal and machinery manufacturing	25,760	4,011	4,180	1,890	73,725	48.6%
All other manufacturing	24,076	1,842	2,093	1,382	56,695	51.8%
General construction	15,105	3,990	2,512	2,216	64,444	37.0%
Construction trades	22,382	5,562	3,394	2,575	84,322	40.2%
Wholesaling	56,606	3,139	4,868	2,959	122,702	55.1%
Retail and hospitality	83,038	9,866	11,132	8,640	288,045	39.1%
Surface transport	10,230	1,703	898	1,225	38,940	36.1%
Air transport	6,127	101	17	68	9,931	63.6%
Services to transport, storage	11,513	880	304	923	25,711	53.0%
Electricity, communications	12,654	353	1,735	866	33,642	46.4%
Finance and insurance	25,062	993	1,515	1,082	56,186	51.0%
Business services	112,444	5,688	11,061	6,287	267,383	50.7%
Arts, sport and recreation	36,670	3,691	4,204	2,460	118,633	39.6%
Government	17,340	1,562	3,276	1,278	74,235	31.6%
Education	39,937	3,645	5,413	3,034	129,445	40.2%
Health Services	32,450	2,022	7,841	4,220	117,601	39.6%
Community Services	12,845	2,010	2,289	1,345	52,017	35.5%
Total	**568,776**	**60,869**	**69,606**	**46,187**	**1,866,747**	**39.9%**

source: BERL Regional Database, Statistics NZ

Some of the main points coming from this table are as follows.

- Those industries in AHT that have above average employment shares tend to be in high value sectors such as manufacturing or service industries, and also the distribution industries.
- As to be expected AHT have a low percentage of all the FTEs in the primary industries (9 per cent) and also primary processing industries (28 per cent).
- Wider Auckland and Tauranga, however, have higher proportions of employment in the primary and processing industries than Auckland Metro or Hamilton.
- Almost one in four FTEs (24 per cent) in Auckland Metro are employed in the Finance, Insurance or Business Services industries. This is between one third and one half higher than the proportion of employment in these industries for Hamilton and Tauranga, respectively. This suggests these smaller cities are reliant on Auckland to some degree, but that this reliance is negatively related to overall employment. That is, the smaller the centre, the greater the reliance.
- AHT has 64 per cent of the country's air transport FTEs. This is to be expected given that Auckland has New Zealand's largest international and domestic airports.

7.5 Employment industry profiles for AHT

Below we show the top five industries by employment for each of the AHT cities. The tables in Appendix 2 provide the full list of industry groups, that is, an industry profile for each city.

Table 7.5: Top 5 industries in the AHT cities (FTEs and %age of regional employment)

Industry rank (FTEs, %emp)	Auckland Metro		Hamilton		Tauranga		New Zealand	
1	Business services		Retail and hospitality		Retail and hospitality		Retail and hospitality	
	112,444	20%	11,132	16%	8,640	19%	288,045	15%
2	Retail and hospitality		Business services		Business services		Business services	
	83,038	15%	11,061	16%	6,287	14%	267,383	14%
3	Wholesaling		Health Services		Health Services		Primary	
	56,606	10%	7,841	11%	4,220	9%	153,603	8%
4	Education		Education		Education		Education	
	39,937	7%	5,413	8%	3,034	7%	129,445	7%
5	Arts, sport and rec.		Wholesaling		Wholesaling		Wholesaling	
	36,670	6%	4,868	7%	2,959	6%	122,702	7%
Sub-total top 5	328,695	58%	40,315	58%	25,140	54%	961,178	51%
Total	568,776	100%	69,606	100%	46,187	100%	1,866,747	100%

Source: BERL, Statistics NZ

The table above shows that Business Services is the largest industry group for Auckland Metro. Auckland's Business Services industry appears to serve (to some extent) most other areas in the country, although Hamilton may be more independent (at 16 per cent); Tauranga sits at the national average of 14 per cent.

The top industries for Hamilton and Tauranga mirror the national rankings to some extent, for example, with Retail and Hospitality as the largest industry in each of these areas. However, the proportion of each city's employment in this industry is higher than the national average of 15 percent.

Some of the main points coming from the broader industry profiles for each city are as follows:

- Most importantly for our study, the industry profiles for Auckland and Hamilton suggest they are large, reasonably independent metropolitan centres. This is apparent in the larger clustering of employment in their largest industries (58 per cent in both cases).
- Auckland and Hamilton have strong wholesaling industries, which tends to correspond with an economy having a healthy manufacturing sector.
- As would be expected most cities have lower employment share in the primary industries than New Zealand as a whole which has 8 per cent. However some 'cities' do, when they are in District Councils which include significant rural areas. These are Napier-Hastings (17 per cent); New Plymouth (10 per cent); Rotorua (9 per cent); Whangarei (8 per cent). Tauranga has a reasonably significant 5 per cent employment in primary industry.

- Tauranga is more similar to provincial centres such as Palmerston North or Napier/Hastings, with 54 per cent of its employment in its largest industries, and a broad spread across its other industries. It is likely that some of Tauranga's economy is served by business services located in Auckland or Hamilton.
- Auckland Metro's share in Business Services is high at 20%, and Wellington City's is higher again at 23%. The area corresponding to the previous Auckland City, has a Business Services share of 25%, the highest in the country. This is to be expected for the area containing the largest CBD in the country.

7.5.1 Comparisons with other provincial centres

The table below focuses on the industry profile of Hamilton and Tauranga and compares this with other provincial economies. For ease of reference, we aggregate the industry level information into ten sectors. As some of the TLA boundaries for provincial 'cities' include rural areas, we focus on the share of employment in non-primary sectors, as this is most likely to be located within the city proper.

Table 7.6 Sector profiles of provincial economies (FTEs and % of non-primary emp)

Industry group (FTEs, % of non-primary emp)	Hamilton		Tauranga		Palmerston North		Napier-Hastings		Whangarei		New Zealand	
Primary	2,875		3,735		1,795		14,728		3,795		253,091	
Manufacturing	6,273	9%	3,273	8%	2,555	6%	2,895	6%	2,539	9%	130,419	8%
Construction	5,906	9%	4,791	11%	3,785	10%	4,456	10%	3,044	11%	148,767	9%
Wholesale/retail trade	16,000	24%	11,599	27%	9,703	24%	11,770	26%	6,625	24%	410,747	25%
Transport	1,218	2%	2,217	5%	1,592	4%	2,101	5%	1,061	4%	74,582	5%
Electricity, communications	1,735	3%	866	2%	452	1%	663	1%	373	1%	33,642	2%
Finance and Business Services	12,576	19%	7,369	17%	5,543	14%	7,649	17%	4,101	15%	323,569	20%
Government	3,276	5%	1,278	3%	3,886	10%	1,472	3%	982	4%	74,235	5%
Education	5,413	8%	3,034	7%	3,535	9%	4,313	10%	2,169	8%	129,445	8%
Health, Comm and Cultural Services	14,334	21%	8,026	19%	8,680	22%	9,669	21%	6,505	24%	288,250	18%
Total	**69,606**		**46,187**		**41,526**		**59,716**		**31,194**		**1,866,747**	

Source: BERL, Statistics NZ ERL, Statistics NZ

Hamilton's profile differs from the smaller provincial economies. It has a clustering of activity in higher value and servicing sectors such as manufacturing, distribution/wholesale trade and business, community or personal services.

Tauranga and Whangarei have reasonably similar sector profiles. They have less than the national average level of employment in the primary and financial sectors, and above average employment in the construction and wholesale/retail trade sectors. This suggests that both these economies sit at an intermediate level in the settlement hierarchy, but with some reliance on Auckland (or Hamilton in Tauranga's case) for higher value tertiary services.

7.5.2 Industry concentration ratios

To supplement this analysis we provide a snapshot the patterns of industry concentration and economic structure within the three city-regions. Table 7.8 shows

industry concentration ratios in 2009 by region and industry.[72] The table also shows the industry concentration ratio for the combined Auckland, Hamilton and Tauranga area for each industry. Table A2.5 in Appendix 2 details the concentration ratios for the comparator cities.

Table 7.8 Concentration ratios by industry and region for the AHT cities (2009)

Concentration ratios (2009)	Auckland Metropolis	Wider Auckland	Hamilton	Tauranga	New Zealand	AHT (ratio of
Primary	0.07	1.41	0.16	0.55	1.00	0.22
Primary processing	0.70	0.85	0.52	0.66	1.00	0.70
Metal and machinery manufacturing	1.15	1.67	1.52	1.04	1.00	1.22
All other manufacturing	1.39	1.00	0.99	0.99	1.00	1.30
General construction	0.77	1.90	1.05	1.39	1.00	0.93
Construction trades	0.87	2.02	1.08	1.23	1.00	1.01
Wholesaling	1.51	0.78	1.06	0.97	1.00	1.38
Retail and hospitality	0.95	1.05	1.04	1.21	1.00	0.98
Surface transport	0.86	1.34	0.62	1.27	1.00	0.90
Air transport	2.03	0.31	0.04	0.28	1.00	1.59
Services to transport, storage	1.47	1.05	0.32	1.45	1.00	1.33
Electricity, communications	1.23	0.32	1.38	1.04	1.00	1.16
Finance and insurance	1.46	0.54	0.72	0.78	1.00	1.28
Business services	1.38	0.65	1.11	0.95	1.00	1.27
Arts, sport and recreation	1.01	0.95	0.95	0.84	1.00	0.99
Government	0.77	0.65	1.18	0.70	1.00	0.79
Education	1.01	0.86	1.12	0.95	1.00	1.01
Health Services	0.91	0.53	1.79	1.45	1.00	0.99
Community Services	0.81	1.19	1.18	1.05	1.00	0.89

source: BERL Regional Database, Statistics NZ

Some of the main points coming from this table are as follows.

- Particularly high concentrations of metal and machinery manufacturing in the Wider Auckland and Hamilton areas.
- Auckland Metro is high in other manufacturing but Hamilton and Tauranga conform to the national average in this sector.
- Hamilton and Tauranga are both over represented in health services.
- The strength throughout the AHT of the finance and insurance, business services and wholesaling industries. Auckland metropolis dominates in Finance and Insurance but Hamilton is above average for Business services, with Tauranga just below average.

Overall, the concentration ratios confirm the patterns we have identified so far, with general trends that would be expected of urban centres and local strengths in Finance and Insurance, business services transport, wholesaling and manufacturing in Auckland,

[72] A **concentration ratio** measures employment in an industry for a particular area relative to employment in that industry for New Zealand overall. Concentration ratios provide an insight into the structure of a local labour market and the relative importance of an industry to that locality. When the ratio is larger than 1.0, the percentage of those employed in the industry locally is higher than the percentage of those employed the overall New Zealand economy. That is, a concentration ratio larger than 1.0 indicates that the local economy has a particularly high concentration of employment in that industry, which suggests that the local economy has a comparative advantage in that industry.

metals manufacturing and health in Hamilton and construction, retail, health and transport in Tauranga.

7.6 Firm linkages between Auckland, Hamilton and Tauranga

In terms of understanding the firm level linkages between the three cities one aspect we are interested in is to see if the large scope of the Auckland metropolitan centre is such as to reduce the size of some industries in Hamilton or Tauranga.

Auckland has a cluster of business services and may act as a national centre for some specialised activities. For example, in one interview with a national business service provider it was explained how Auckland is critical for generating ideas, innovations and new products within that industry through the high concentration of skills and staff turnover. While Hamilton and Tauranga have a smaller share of their employment in business services, their levels are generally similar to other provincial city economies rather than being substantially serviced by Auckland.

Understanding the linkages which exist within the service sector is an important part of our analysis. In a recent paper examining the results of 34 different studies of agglomeration effects Melo et al (2009) pointed out that "while historically agglomeration of manufacturing was of interest, the larger potential benefits of service sector agglomeration deserve further study."[73] The authors found that service industries tend to derive considerably larger benefits from urban agglomeration and estimated that the elasticity of urban agglomeration for service industries is about 8 percent higher than the elasticity estimates for the aggregate economy in the United States. However, understanding these linkages also poses a challenge due to a conspicuous lack of data, compared to more tangible economic activity such as freight movements. Data on service linkages and movements is particularly scant. As a way of validating the available data and adding to our understanding of service activities in the region we report some of the responses to the 21 face-to-face interviews we undertook with a number firms in key sectors or with appropriate public sector organisation in this section.

The following sub-sections look at the positions of the three cites within four key sectors in order to help establish the presence of economic connections or self-sufficiency. We supplement this analysis with relevant interview comments.

7.6.1 Business services

In general Business Services, Auckland has a strong 20 per cent of employment compared with the national average of 14 per cent. Hamilton however is also strong with 16 per cent, and this is a larger share than similar-sized cities, Dunedin (14 per cent) and Napier-Hastings (11 per cent). This tends to support the view we received from interviewees that Hamilton was relatively self-sufficient in the provision of most business services and acted as a service centre for the surrounding region. Tauranga has 14 per cent which is the national average and similar to Christchurch, Dunedin, Lower Hutt, and New Plymouth. Interestingly Central Otago and Queenstown Lakes Districts also had shares of about 14 per cent, presumably reflecting a lifestyle business location choice. Tauranga's 14 per cent share is greater than most other cities which had about 11 per

[73] Melo, P.C., Graham, D. J. and Noland, R.B., 2009, *A meta-analysis of estimates of urban agglomeration economies.* Regional Science and Urban Economics 39 (2009) 332–342. p341.

cent share in Business Services. These cities include Napier-Hastings, Whangarei, Manukau, Waitakere, Rotorua, Palmerston North, Porirua, Upper Hutt, Nelson and Invercargill. Again, this confirms the views expressed by our interviewees that although some specialised business services were likely to be sourced from other centres, generally Auckland, Hamilton or Wellington, for many business service activities Tauranga was able to meet local needs.

With the specific services of finance and insurance, there is evidence of Auckland's specialisation, Auckland has a 4 per cent share of employment in this sector whereas Hamilton and Tauranga and all other cities except Wellington had just a 2 per cent share. However, Wellington exhibited even stronger specialisation with an 8 per cent share. It therefore seems that Auckland and Wellington have most of the capacity in these industries.

7.6.2 Cultural services

Cultural services like arts, sport and recreation provide a different story. The national average is 6 per cent but 5 cities have shares above this level. Hamilton has a 6 per cent share, and Tauranga a 5 per cent share. Cities with larger shares are Dunedin (7 per cent); Rotorua (8 per cent); Palmerston North and Invercargill (7 per cent); and Wellington with 9 per cent. While Auckland has only the national average of 6 per cent share, the quantum is much greater, in fact employment is 36,000 which is three times that of Wellington and many multiples of employment in other cities. It does appear that the size of this sector in Auckland may well be suppressing a little its size in Hamilton and Tauranga. Looked at another way, in a cultural, sport and recreation sense, the AHT triangle appears to some extent to function as a single entity. One of our interviewees noted that one difficulty of attracting new staff to Hamilton was that the city was perceived to be lacking in cultural amenities, however, proximity to Auckland was seen to be an advantage in this respect.

7.6.3 Goods-producing industries

In the goods-producing industries, the most interesting effects are seen in the Metal and machinery manufacturing, construction and wholesaling. In Metal and machinery manufacturing the national average employment share is 4 per cent whilst Hamilton has a very strong 6 per cent, reflecting the city's role as an agricultural service centre with specialised manufacturing services which have now become generalised beyond the dairy sector. Auckland is quite strong in this area at 5 per cent and also in all other manufacturing with 4 per cent.

In construction, the national average is 3 per cent which is also the Auckland share. Hamilton and Tauranga are stronger at 4 per cent and 5 per cent respectively. The other main metropolitan areas of Wellington (2 per cent) and Dunedin (3 per cent) are close to the national average of 3%, whereas the provincial cities of Palmerston North, Whangarei, New Plymouth and Invercargill all have shares of 4 per cent to 5 per cent. The Auckland Hamilton Tauranga position does not seem to vary from the national pattern in construction.

In wholesaling, Auckland is strongest, based on its manufacturing and import-export function. Hamilton and Tauranga are both moderately strong compared with other cities, reflecting the high level of production activity in these cities and their hinterlands.

7.6.4 Health linkages

In health there are much wider spreads. The national average is 6 per cent which is the same in Auckland. However Hamilton has 11 per cent and Tauranga 9 per cent which implies that neither relies much, if at all on Auckland for health services. Other cities with high employment shares in health are Whangarei (11 per cent) Palmerston North and Invercargill (9 per cent) and Dunedin and Rotorua (8 per cent).

However, one would assume that one area of possible linkage between the cities is the provision of healthcare and in particular advanced medical services. Health care is provided at four main tiers:

- Primary health care at a local level
- Secondary hospitals with a range of capabilities, although these differ from area to area
- Tertiary hospitals providing a wider range of services including more specialised facilities and supplementing the services offered at a secondary level
- Quaternary hospitals providing a range of specialised services at a national level

In the AHT region the BOP District Health Board (DHB) focussed on Tauranga provides secondary services. The Waikato DHB provides the next tier of services supporting the activities in the Bay of Plenty DHB area (and also the Lakes DHB area centred on Rotorua). Some oversight of activities undertaken in the BOP DHB area is also undertaken by Waikato.

Because of the way in which services are provided with not all available in secondary hospitals, patients requiring more advanced treatment are referred up the chain. The scale of these linkages in terms of spending on services between the regions is set out in Table 7.7. This shows the value of services incurred by residents of each DHB in their own or other DHBs.

Table 7.7 Budgeted Spending on Health Care by AHT DHBs 2010/2011 ($ millions)

		Area of Supply of Services			
		Auckland	**Waikato**	**Bay of Plenty**	**Lakes**
Area of domicile of users	Auckland	2,735	14	3	2
	Waikato	24	592	4	3
	BOP	14	35	342	8
	Lakes	8	24	3	160

Source : Waikato DHB

The table indicates that there is a substantial use of Waikato hospital facilities by residents of the Bay of Plenty DHB area with the DHB buying services worth almost $35 million from the Waikato DHB, mainly for advanced medical services which are not available in the Bay of Plenty. BOP residents also use the services of the Auckland DHBs for possibly even more specialised services with a value of almost $15 million. The Waikato is rather more self-sufficient but purchases some healthcare services from Auckland. The position in the Lakes DHB centred on Rotorua is largely similar to that of Tauranga with substantial purchase of health care services from the Waikato DHB and

smaller purchases from Auckland. Therefore, there are some elements of integration in the provision of health services between Hamilton and Tauranga but not significantly between these two cities and Auckland.

7.6.5 Firm linkages - interview comments

The stakeholder interviews support the evidence which indicates that Tauranga and Hamilton are quite self-contained economies and that the economic linkages between the three cities are not particularly special or unusual. As one respondent noted "Hamilton and Tauranga have few linkages. There is a sense that few firm linkages exist and they are insular economies."

The interview responses confirm the view that both cities are well provided locally with respect to most day-to-day business service activities. Only the more specialised business services tend to be sourced regularly from other cities and it appears that for legal and financial services these may as easily be sourced in Wellington as Auckland.

- A major exporter in Tauranga told us that they sourced banking services for foreign exchange in both Auckland and Wellington. Specialist legal services were sourced locally and from Wellington only where this was not possible.
- One major Tauranga company had worked with a local law firm to develop in-house resources to meet their legal needs locally. Another major Tauranga company confirmed, "they were self contained in legal, IT, tax, audit and engineering in Tauranga."
- Another major Tauranga company confirmed, "they were self contained in legal, IT, tax, audit and engineering in Tauranga."

A theme in Tauranga was the strong motivation to buy locally and support local business service providers. As one respondent put it, "CEOs have a focus on buying locally but some specialised services are sourced from other centres."

One respondent pointed out that "clients expect local solutions but want to be able to draw on specialist services across nationally recognised firms. That means the office in Tauranga or Hamilton acts as a front door to whole organisation." This was echoed by consulting planning and engineering firms. The general view was that local services were best provided from local offices and only for major projects were specialised skills required. These skills would be more likely to be present in larger offices around the country but there was no obvious policy amongst firms interviewed to create geographically specific centres of specialisation. It seemed to be more related to where a particular specialist lived.

- A respondent saw "Tauranga becoming a more self-contained as a city" and respondents generally saw Tauranga as being "well provided for in terms of business service activities…KPMG in town, national level PR, creative, legal and accounting services."

A significant factor supporting the use of local service providers, in Tauranga at least, appears to be cost. As one business service provider explained, "the charge out rates for partners is $360 hour in Tauranga but is $600-$700 hour in Auckland. The provinces can't compete with Auckland rates as it is important to stay close to local competitors."

In terms of the within firm linkages between the three cities, this is very hard to gather data on but the general perception amongst our interviewees in nationally significant

business service firms was that around 90 per cent of the work that was brought in by the Tauranga and Hamilton offices was carried out using local resources with around 10 per cent being undertaken by specialists in other locations around the country.

Interviews with those involved in the agri-science sector revealed the existence of significant patterns of collaboration and linkages but again these did not suggest an unusually high level of dependence on Auckland. In fact the linkages associated with undertaking research often involved Palmerston North, Christchurch/Lincoln and even Kerikeri as well as Auckland. However, in the provision of agri-science services associated with productivity of land it is clear that Hamilton has particular expertise which interviewees noted is provided to other areas (e.g. the Bay of Plenty) and it would not appear viable for a centre such as Tauranga to attempt to replicate this capability. However, this is not an outcome arising from the presence of a city-system, rather it is a consequence of Hamilton successfully leveraging off it's function in the dairy sector.

We interviewed limited manufacturing firms but in one case there was a clear pattern of raw materials (metal and glass) being sourced from Auckland, manufacturing taking place in Tauranga and finished products being exported via Tauranga or Auckland. This firm had relocated to Tauranga from Auckland due to lifestyle reasons but continued with long standing suppliers. In this case the high value nature of the products involved meant that transport costs were a very small part of the total cost of the finished product.

The interviews did identify that Tauranga in particular relies on Auckland to fill certain specific skills gaps. For example, IT staff shortages were seen by one large exporter as the most pressing resourcing issue in Tauranga. This company had relocated its business service activity from Auckland to Tauranga and most IT staff had not relocated from Auckland with the company. The company actively sought contract staff from Auckland when needed. A major accounting firm concurred that providing specialists in certain areas was difficult in Tauranga but this was a fact of the size of the market: "In Tauranga we can't have business consultants and SAP trained staff as the workload is too small."

The general theme which emerged from conversations with both firms and other stakeholders, including local economic development agencies (EDAs), was that both Tauranga and Hamilton are quite self contained economies and are well provided locally with respect to most day to day business service activities. Only the more specialised business services tend to be sourced regularly from other cities and it appears that for legal and financial services these may as easily be sourced in Wellington as Auckland. The analysis of firm linkages supports the view that the three cities appear to operate as relatively independent economies and do not appear to exhibit any notably unusual patterns of firm linkages.

7.6.6 Summary

Overall, the information on the inter-relationships between the three cities confirms the view that they are to a large extent self-sufficient and economically independent of each other, although there is evidence to suggest that Hamilton and Tauranga are more closely aligned in terms of health and tertiary education provision. The evidence continues to indicate that we are dealing with three reasonably self-contained city-region economies that have developed in a largely autonomous way, driven by local economic factors. The suggestion is that Auckland, Hamilton and Tauranga are the economic centres of their own regions, with corresponding economic foundations within these

regional economies but are not to any great extent three well connected and jointly functioning economic centres within an inter-regional agglomeration or city system.

7.7 Changes in economic structures across time

The changing patterns of the economic structures within each of the three cities can provide further indications of whether the cities are growing into a more closely integrated city-system or whether they are continuing to grow largely independently of one-another. We examine changes in employment structures, value added and concentration ratios.

7.7.1 Employment industry concentrations across time

This considers how employment by industry in each of the three city-regions has changed between 1996 and 2009.[74] The supposition behind the analysis is that the observed changes in industry structure will shed more light on the patterns of development within the three cities so that we can assess whether this is reflecting growing economic linkages or continuing self-sufficiency and economic growth arising from local economic foundations and conditions.

Auckland Metro

For the Auckland Metro area the level of FTEs employed in the business services industry has grown from 14 per cent in 1996 to 20 per cent in 2009, a substantial increase underlining the gradual structural transformation of Auckland's economy. Other interesting changes we can see are that from 2001 to 2006 the retail and hospitality industry grew at 3.5 per cent per annum, yet the industry percentage of total FTEs shrank from 15.3 per cent to 15 per cent. This was caused by the fact that the per annum growth for this period in total FTEs was 4 per cent, which meant any industry growing slower shrank in relative importance within the region.

Hamilton

For the Hamilton region, in 1996 only two industries had more than 10 per cent of the total share of FTEs: the retail and hospitality (17 per cent), and business services (12 per cent) industries. In 2009 both of these industries are still important, with each employing 16 per cent of the total FTEs. However, by 2009, the health services industry had also grown in importance in terms of its share of employment at 11 per cent of the region's total FTEs. Hamilton experienced significant per annum growth in FTEs during the 2001-2006 period (5.4 per cent per annum on average). This rate has subsided during the last three years with Hamilton FTEs growing at just 0.9 per cent per annum.

Tauranga

In 1996, only one industry in the Tauranga region had more than 10 per cent of the total share of FTEs. This was the retail and hospitality industry, with 19 per cent of all FTEs. In 2009 this industry is still highly important employing 19 per cent of the total FTEs, though now business services also employs more than 10 per cent of the FTEs with 14 per cent. Tauranga experienced significant per annum growth (5.4 per cent) in FTEs

[74] The detailed data tables supporting this analysis and more detailed discussion around employment concentration trends can be found in Appendix 2. See tables A2.7 to A2.13.

during the 2001-2006 period this has subsided during the last three years with Tauranga FTEs growing at just 1 per cent per annum.

7.7.2 Value Added (GDP)

The following tables shows us for each of the top five industries by GDP over four time points. The tables also give us the annual percentage change between each of the time points calculated from the raw GDP numbers for the region. Appendix 2 contains more detailed tables for each area showing the full set of industries.

Table 7.9 Value added across time by top five industries (GDP 2009$m) Auckland Metro

Value added in Auckland Metro	% of area's total				%pa change		
(GDP $2009m)	1996	2001	2006	2009	1996-2001	2001-2006	2006-2009
Business services	25%	24.5%	24.7%	25.5%	3.5%	4.7%	2.3%
Wholesaling	12.6%	13.0%	11.6%	10.9%	4.6%	2.2%	-1.0%
Finance and insurance	6.2%	7.8%	8.8%	10.0%	8.9%	6.9%	5.7%
Electricity, communications	5.6%	7.8%	9.4%	9.5%	11.1%	8.5%	1.5%
Retail and hospitality	7.2%	6.7%	7.0%	6.9%	2.4%	5.5%	0.4%

source: BERL Regional Database, Statistics NZ

For the Auckland Metro area we can see from the table that business services over the 13 years covered by the four time points has consistently produced a quarter of the area's GDP. Also of interest is the growth over the years of the finance and insurance; and electricity, communications industries. The finance and insurance industries have grown their share of the areas GDP from 6.2 per cent in 1996 to 10 per cent in 2009. This industry is of particular interest as apart from the Auckland Metro area it is shrinking in the other areas. This is one of the few clear examples of Auckland's specialisation. The electricity, communications industries have also been doing well over the 13 years in the Auckland Metro area going from 5.6 per cent of the areas GDP in 1996 to 9.5 per cent in 2009.

Table 7.10 Value added across time by top five industries (GDP 2009$m) Hamilton

Value added in Hamilton	% of area's total				%pa change		
(GDP $2009m)	1996	2001	2006	2009	1996-2001	2001-2006	2006-2009
Business services	23%	20.4%	22.7%	22.6%	0.5%	7.5%	0.8%
Electricity, communications	8.8%	12.5%	10.4%	11.6%	10.7%	1.3%	4.7%
Health Services	7.2%	8.1%	8.2%	8.8%	5.7%	5.4%	3.4%
Retail and hospitality	8.0%	7.7%	8.0%	8.3%	2.5%	5.8%	2.1%
Wholesaling	8.1%	8.4%	8.9%	8.2%	3.7%	6.6%	-1.8%

source: BERL Regional Database, Statistics NZ

For the Hamilton area we can see from the table that business services over the 13 years covered by the four time points has consistently produced just over 20 per cent of

the area GDP. We note that the finance and insurance industries in this area have shrunk in terms of their relative importance (see Table A2.10 in Appendix 2). The finance and insurance industries' share of the area's GDP has fallen from 5.9 per cent in 1996 to 5.4 per cent in 2009. While these industries have grown in dollar value terms, the fall in the share of the area's GDP over the 13 years reflects the rapid growth in some of its other industries. But the relative contraction in the Hamilton area mirrors the increasing importance of the finance and insurance industries in the Auckland Metro area over this period.

Table 7.11 Value added across time by top five industries (GDP 2009$m) Tauranga

Value added in Tauranga	% of area's total				%pa change		
(GDP $2009m)	1996	2001	2006	2009	1996-2001	2001-2006	2006-2009
Business services	23%	22.4%	21.6%	24.3%	4.7%	4.9%	4.7%
Retail and hospitality	9.2%	8.8%	9.6%	9.8%	4.2%	7.5%	1.2%
Electricity, communications	6.8%	9.6%	10.6%	9.1%	12.5%	7.9%	-4.6%
Wholesaling	8.1%	8.3%	7.9%	7.4%	5.7%	4.5%	-1.5%
Health Services	5.0%	4.3%	5.7%	7.1%	1.7%	12.0%	8.3%

source: BERL Regional Database, Statistics NZ

As for the other areas, Tauranga's business services over the 13 years covered by the four time points has consistently produced just over 20 per cent of the area's GDP. Of interest for the Tauranga area is the high per annum growth the area enjoyed from 1996 to 2006 when its GDP was growing at over 5% pa. This growth has rapidly slowed down over the last 3 years due to the recession and the slowdown in the growth of population in the city. Also of interest to us is the growth in the health services industry especially over the period from 2001 to 2009, where there has not been a similar growth in the Auckland Metro and Hamilton areas.

7.7.3 Industry concentration ratios over time

The following tables show the top five industries by relative importance, as measured by concentration ratios for each city. The industry concentration figures inform us which industries are particularly focused in the city. A figure above 1 indicates that the industry is more concentrated in that region than in New Zealand as a whole. The tables also give us the annual percentage change between each of the time points calculated for the region.

Table 7.12 Concentration ratios across time by top five industries - Auckland Metro

Concentration ratios in Auckland					%pa change		
Metro	1996	2001	2006	2009	1996-2001	2001-2006	2006-2009
Air transport	2.09	2.11	2.08	2.03	0.2%	-0.2%	-1.0%
Wholesaling	1.61	1.62	1.53	1.51	0.0%	-1.1%	-0.3%
Services to transport, storage	1.59	1.53	1.46	1.47	-0.8%	-0.9%	0.2%
Finance and insurance	1.21	1.41	1.44	1.46	3.1%	0.5%	0.5%
All other manufacturing	1.56	1.48	1.41	1.39	-1.1%	-0.9%	-0.5%

source: BERL Regional Database, Statistics NZ

Table 7.13 Concentration ratios across time by top five industries - Hamilton

Concentration ratios in Hamilton	1996	2001	2006	2009	%pa change 1996-2001	2001-2006	2006-2009
Health Services	1.83	1.83	1.80	1.79	0.1%	-0.3%	-0.3%
Metal and machinery manufacturing	1.32	1.52	1.44	1.52	2.8%	-1.0%	1.7%
Electricity, communications	1.51	1.58	1.31	1.38	0.9%	-3.6%	1.7%
Government	0.97	1.18	0.85	1.18	4.0%	-6.3%	11.4%
Community Services	0.76	0.98	1.20	1.18	5.2%	4.3%	-0.7%

source: BERL Regional Database, Statistics NZ

Table 7.14 Concentration ratios across time by top five industries - Tauranga

Concentration ratios in Tauranga	1996	2001	2006	2009	%pa change 1996-2001	2001-2006	2006-2009
Services to transport, storage	2.18	2.01	1.71	1.45	-1.6%	-3.2%	-5.3%
Health Services	1.28	0.95	1.28	1.45	-5.8%	6.0%	4.4%
General construction	1.72	1.66	1.64	1.39	-0.7%	-0.2%	-5.5%
Surface transport	1.26	1.18	1.24	1.27	-1.3%	1.0%	0.8%
Construction trades	1.47	1.47	1.39	1.23	-0.1%	-1.1%	-3.8%

source: BERL Regional Database, Statistics NZ

Overall, again this shows us that Auckland has become relatively more specialised in the areas of Business Services and Finance and Insurance. Both Hamilton and Auckland are consistently becoming relatively less reliant on primary activities, whereas for Tauranga the picture is one of a slight increase in concentration against a pattern of variability in this sector (see the full industry concentration tables in Appendix 2).

7.7.4 Discussion of sectoral changes, local economic foundations and specialisations

There are examples of some specialisation emerging among the AHT cities, but this is generally strongly connected to the economic foundations of local economy. Hamilton, reflecting it's role as the service centre for the Waikato dairy sector is high in scientific research services, primarily driven by the agri-science sector, with strong representation in the city from agencies including Ag Research, Plant and Food Research, NIWA, Land Care, Innovation Waikato, tertiary institutions and the private sector. Much of the work undertaken by these agencies is focused on the efficiency of the production side of the primary sector, essentially improving the productivity of the land. However, there is also growing focus around the processing and transformation of primary produce and the opportunities for adding value through the developments of new products, or processes that allow movement up the value chain. For example, one major Crown Research Institute (CRI) interviewed indicated that about one third of it's efforts were direct at value added, one third at productive efficiency and one third around sustainability.

However, this emphasis on developing a scientific research capability to support the surrounding primary sector is not evident in Tauranga. The horticultural sector appears to source its scientific input from Hamilton, Auckland, Palmerston North and even Kerikeri. The interviewees we talked to observed that the expertise in Hamilton around the productivity of soil translated very well to horticulture, meaning that the development of local expertise was not necessary.

The primary sector of the Bay of Plenty does not appear to show any significant progress to movement up the value chain, from the current patterns of harvest and export to higher value processing activity.

Kiwi fruit production is characterised by a very efficient growing, transport and export operation. The supply chain is centralised on Tauranga, the main export port for bulk fruit. A spin off from this is the potential for the development of tertiary studies focusing on supply chain management in Tauranga. However, very little processing of kiwi fruit is observed, although a small amount does take place in Auckland.

Similarly, log exports through Tauranga comprise a substantial part of the activity of the Port. With the exception of the pulp and paper industry there is little value added activity in the forestry sector at present. One respondent noted that labour costs in New Zealand made this uneconomic. Another pointed out that when log prices were high the supply of wood for processing was compromised as the incentive was to export as much unprocessed timber as possible and when prices were low the incentive was to reduce the harvest and leave trees in the ground.

A notable difference between Hamilton and Tauranga is revealed by the forestry sector. Whereas Hamilton is the only major service centre for the Waikato area the Bay of Plenty is served by both Tauranga and Rotorua, with Rotorua being the recognised centre of research into the forestry industry with Scion, a CRI located in the city.

The evidence suggests that whilst Hamilton can attribute a large part of its economic strength to its role in supporting the growth of the dairy industry the same opportunities will not be available to Tauranga, with horticulture being less capital intensive, less amenable to processing and significantly smaller than the dairying industry and with forestry being heavily incentivised towards the export of unprocessed logs and with research located in Rotorua.

A feature of Auckland is the concentration of activity devoted to the more complex transformation of primary produce. Whereas the rural areas of the Waikato are notable for the transformation of raw produce into more easily transportable solids Auckland is much more active in taking raw and basically processed primary output and transforming this into higher value products, essentially moving this output up the value chain.

A recurring theme we observed amongst interviewees was the view that Tauranga offered a ‘lifestyle advantage’ compared to Auckland and Hamilton. One interviewee had recently relocated his engineering business to Tauranga from Auckland. This particular firm provided an interesting localised example of a supply chain between the cities, with metal and glass being sourced form the Auckland area, manufactured into specialist marine products in Tauranga and then exported either from the Port of Tauranga or Auckland Airport. The interviewee noted that the only constraint to the success of the business was the recruitment of skilled staff but an apprenticeship scheme had been established to address this. Interestingly, when asked about the potential to relocate to a bigger centre to source additional skilled workers the respondent thought that would be impossible as the existing skilled staff would not want to leave their current location, due to the quality of life. Another example is the potential development of a titanium sector in Tauranga which is arising as a possibility due to the patent holder of a powder metallurgy process relocating to Tauranga for lifestyle reasons. These observations lead us into a profiling of the three cities in the next section.

7.8 Summary

In this section we examined the economic performance and structure of the three cities in order to draw comparisons between the three cities (and with other New Zealand cities). This was intended to assist to identify whether a city system can be observed to be emerging within the AHT region. Most importantly for our study, the industry profiles for Auckland and Hamilton suggest they are large, reasonably independent metropolitan centres. This is apparent in the larger clustering of employment in their largest industries (58 per cent in both cases). This is consistent with the expectations developed in Sections 3 and 4 and the analysis of economic linkages in Sections 5 and 6.

Our analysis of economic structure considered the location of different components of sectoral supply chains within the region and reasons for the location, type/size of firms. The analysis began by emphasising the differences in absolute scale between the three cities and the dominance of Auckland with over five time the population of Hamilton and Tauranga combined, whilst noting that in terms of population growth rates, all three cities are well above the national average and contributed two thirds of the county's population growth between 1996 and 2009.

Auckland metropolis and Hamilton are similar in terms of their recent employment growth profiles (and GDP growth profiles) whereas for Tauranga employment grew more quickly. Overall, Auckland, Hamilton and Tauranga combined account for 40% of the total New Zealand FTEs, with the bulk (just under one third of the country's employment) in Auckland Metro area alone. Key features of employment in the AHT region include:

- Those industries with above average employment shares tend to be in high value sectors such as manufacturing or service industries, and the distribution industries.
- As would be expected AHT have a low percentage of all the FTEs in the primary industries (9%) and also primary processing industries (28%).
- Wider Auckland and Tauranga, however, have higher proportions of employment in the primary and processing industries than Auckland Metro or Hamilton.
- A notable difference between the three cities is that almost one in four FTEs (24%) in Auckland Metro are employed in the Finance, Insurance or Business Services industries. This is between one third and one half higher than the proportion of employment in these industries for Hamilton and Tauranga, respectively.

This suggests that smaller cities are reliant on Auckland to some degree, but that this reliance is negatively related to overall employment within a city. That is, the smaller the centre, the greater the reliance on Auckland. This is apparent in the larger clustering of employment in their largest industries.

For example, Auckland and Hamilton have strong wholesaling industries, which tends to correspond with an economy having a healthy manufacturing sector. Compared with other provincial economies, Hamilton's clustering of activity in higher value and servicing sectors such as manufacturing, distribution/wholesale trade and business, community or personal services is an unusual and defining characteristic.

On the other hand Tauranga is more similar to the profile that would be expected of a provincial centre such as Palmerston North or Napier/Hastings, with 54 per cent of its employment in its largest industries, and a broad spread across its other industries. It is likely that some of Tauranga's economy is served by business services located in

Auckland or Hamilton. For example, Tauranga and Whangarei have reasonably similar sector profiles. They have less than the national average level of employment in the primary and financial sectors, and above average employment in the construction and wholesale/retail trade sectors. This suggests that both these economies sit at an intermediate level in the settlement hierarchy, but with some reliance on Auckland (or Hamilton in Tauranga's case) for higher value tertiary services.

In summary, the analysis suggests that the three cities appear to operate as relatively independent economies. Auckland and Hamilton, in particular, have distinct and strong economic bases. Auckland provides a cluster of business services and acts as a national centre for such activity. While Hamilton and Tauranga have a smaller share of their employment in business services, their levels are similar to other provincial city economies rather than being substantially serviced by Auckland. Hamilton has a strong economic base is grounded in it's role as the service centre for the primary production area of the Waikato. It has diversified into wide range of metal manufacturing activities and is now supporting a growing presence of research activity in the agri-science sector.

Interviews with firms and stakeholders, including economic development agencies, confirmed that both Tauranga and Hamilton are quite self contained economies and are well provided locally with respect to most day to day business service activities. Only the more specialised business services tend to be sourced regularly from other areas.

What doesn't come through so clearly in the higher level data but does emerge from drilling down into changes over time, and is reinforced by the responses of many interviewees, is that Tauranga is actually semi-independent and not dependent on Auckland. This is exhibited in the gravitation of some finance services from Tauranga to Auckland but also an increase in Tauranga of some particular business services and the notable reliance on local business service providers amongst Tauranga's businesses.

8 Supply chains and connections within the AHT Region

8.1 Introduction

In this section we examine the nature of supply chains between the three cities in the AHT to shed more light on the economic the interactions in the AHT region. While movements of goods between the three cities or at least between the regions in which they are situated are fairly easy to distinguish from the available data, the movement of services may not be accompanied by a physical movement either of goods or people and therefore can only be identified on a notional basis. There are also identification issues where a service, such as the international connectivity offered by Auckland Airport, generates flows to and from the airport. For this analysis we have described the supply chain focussing on the facility which generates the flow.

8.2 The Position for Auckland

Within the study area, Auckland acts as the key distribution centre, the major manufacturing centre and the main market for retail and manufactured goods. It is the main location of financial and other business services, research skills and is a major health and education centre. It is also the location of Auckland Airport which acts as the key international gateway for the study area as a whole.

Auckland attracts imported goods through the port of Tauranga, to supply manufacturing and retail activities in the city and also to supply distribution centres for onward distribution to Hamilton and Tauranga. The outputs of local manufacturing and also commodities produced elsewhere are also typically distributed through Auckland to local markets and markets across the rest of New Zealand.

One example of a way in which value added activities are being incorporated in the supply chain is the focus on developing Auckland's processed foods sub-sector. A good example is the Manukau Food Innovation Centre being developed at a site close to Auckland Airport. The Centre aims to bring together research facilities and expertise, skilled manufacturing and business expertise in combination with close proximity to large local markets and sources of supply. Taking advantage of these factors and the benefits of good access to international markets for both passengers and goods offered by the airport itself, the centre will aim to develop new high value commercial products which are capable of being exploited commercially. A good example already in operation close to the Centre is Nekta Nutrition, making value-added products from kiwifruit sourced from the Bay of Plenty.

8.3 The Position for Hamilton

Hamilton acts as an important manufacturing centre, initially developing to support the needs of the local dairy industry for which Waikato region has particular strengths. This has subsequently developed to extend to a wider range of products supplying domestic and international markets. This expertise has also been taken up by the aerospace sector which has developed at Hamilton airport.

The Waikato area is also the producer of a range of primary products including particularly milk and dairy products and logs and timber products. Supply chains have been developed to consolidate the flows of manufactured dairy products from the region as a whole through the freight hub in Hamilton and these are then exported by rail primarily via Auckland but also with the alternative of using Tauranga. Other primary export products are mainly routed through Tauranga especially logs and to a lesser extent through Auckland for products which include more processing. The manufacturing industries are supported by strong research and development skills from a number of agencies located in Hamilton. These to a large extent focus on producing and harvesting primary products more efficiently through for example the development of advanced milking systems and other farming equipment and in improved breeding processes.

Hamilton acts as a regional service centre for the Waikato and is also a provider of services particularly in health and education further afield for Tauranga and the Bay of Plenty in general. It does however rely on Auckland for the provision of high level of services and for comprehensive international access via Auckland airport.

8.4 The Position for Tauranga

Tauranga is an important transport hub focussed round the port. This supports the movement of both primary products to and from Bay of Plenty, Waikato and to a lesser extent other regions in the upper and central North Island and also more sophisticated manufactured and retail products to and from the Auckland region, for which it acts as a second port. These movements create strong linkages with Auckland and the Waikato region although only to a limited extent with Hamilton itself. The area is the centre of kiwifruit growing, but with the relocation of Zespri to Tauranga, allowing it to be able to manage the supply chains more effectively, this operation is to a large extent self contained except for a small level of sales on the domestic market and the linkages with Hamilton and Auckland are limited.

The area benefits from lifestyle advantages which have encouraged a degree of migration, including from Auckland and Hamilton. While this has a strong focus on people in the older age ranges, there is also substantial migration of younger people a number of whom have established small businesses. Many of these migrants still have strong connections with Auckland, including for the supply of a range of inputs and for either domestic or international sales and so generate movements of both goods and services. However, while the owners of these businesses benefit from lifestyle factors, there are difficulties associated with the remoteness from suppliers and customers and from the limited local availability of skilled employees, their longer term development in and around Tauranga and their impacts on supply chains may be constrained.

8.5 Overall Assessment

Given the large number of activities undertaken in the region, the resulting supply chains are very complex, and the analysis above describes only the major features. For freight, the key elements are:

- The role of Auckland as a key market and distribution centre for manufactured and other retail goods for the whole area;

- The links between Auckland and Tauranga for the movement of imports and exports to and from Auckland; and
- The movements of basic commodities from producers in rural areas to international and domestic markets via Tauranga and Auckland.

For business services Auckland is also the dominant location, although there is a substantial degree of self sufficiency in both Hamilton and Tauranga for all but the more specialised services. Auckland dominates the supply of educational and health facilities although again there has been substantial development of these in the Waikato.

The ways in which the three main cities in the AHT region can be considered to interact in terms of the movement of goods and also in the provision of services are summarised in Table 8.1. This also sets out an assessment of the potential importance of each of these interactions:

Table 8.1: City Interactions within the AHT Region

Interactions between Cities	Level of Importance
Auckland-Tauranga	
Movement of Goods	
Manufactured goods for export	H
Distribution of manufactured and other goods for local markets	L
Provision of services	
Auckland Airport as international gateway for passengers and airfreight	H
Provision of high level business services	H
Provision of research skills	L
Tauranga to Auckland	
Movement of Goods	
Import of manufactured goods through Tauranga	H
Local produce particularly horticultural goods for Auckland market	L
Export of finished products through Auckland	L
Provision of services	n/a
Auckland-Hamilton	
Movement of Goods	
Distribution of manufactured and other goods for local markets	M
Provision of services	
Auckland Airport as international gateway for passengers and airfreight	H
Provision of high level business services	H
Provision of research skills	L
Hamilton-Auckland	
Movement of Goods	
Movement of goods for export	M
Provision of local goods for Auckland market	L
Provision of services	
Provision of research skills	L

Hamilton-Tauranga	
Movement of Goods	
Export of primary produce	H
Provision of services	
Hamilton Airport as international gateway for passengers	L?
Provision of high level business services	M
Provision of research skills	L
Tauranga-Hamilton	
Movement of Goods	
Import of primary products	M
Provision of local goods for Auckland market	L
Provision of services	
Some provision of business services	L

8.6 Specific Examples of Supply Chains

Two examples of supply chains are possibly worth exploring to illustrate the nature and location of the activities which take place.

The movement and transformation of **milk** in the Waikato starts with the production of liquid milk at a wide number of locations. In order to allow the most efficient use to be made of the basic inputs, there has been considerable development in advanced techniques for making the most effective use of the land available. These include:

- Breeding cows that are most able to produce the types of milk required by the market and limit any environmental impacts;
- Developing improved feeds for cows both natural and manufactured; and
- Developing advanced milking equipment which reduces the labour input and reduces any losses.

Although the milk is produced at rural locations, research and development to support these advanced activities typically takes place within urban areas where the agencies undertaking this work are able to call on a wide range of suppliers and skills in the labour force. There are however advantages in being close to producers to be able to monitor any changes. As a result, a cluster of supporting these activities has developed in Hamilton which combines the advantage of a reasonable large urban location with proximity to producers.

At a number of dairy factories located in the Waikato, the liquid milk is converted into a number of products particularly dried milk and cheese for export, and these are consolidated at the Crawford Street Freight Village for onward transport by rail. This is located approximately equidistant from Auckland and Tauranga giving Fonterra a high degree of flexibility in the routing of their exports.

There is however the potential to add further value to these commodities by developing more sophisticated products. For this activity, access to markets both international and domestic and to a high level of skilled labour is more important than proximity to producers and so a focus for this is developing in Auckland as evidenced by the establishment of the Food Innovation Centre.

For milk therefore activities in the main urban areas have two main focuses, in the first seeking more effective and efficient ways of producing the milk, and in the second seeking to add value by developing new products.

For the second example **kiwifruit** the position is slightly different because in general the product itself is not in general transformed between picking and sale to the final customer. Much of the effort required is therefore in efficient supply chains and the location of Zespri within the producing area and adjacent to the port from where the majority of the product is shipped reflects this. The other area where Zespri is particularly involved is on the development of improved species and here again proximity to the growing areas is potentially an advantage.

As in the case of milk, there has also been interest in developing value added products. Again much of this has been undertaken in Auckland to take advantage of the proximity to markets and the availability of skilled staff. As yet however the scale of this activity is small caused in part by the inherent challenges presented in processing kiwifruit.

9 Profiles of the Three Cities

9.1 Introduction

The material set out in a number of the preceding sections has described various aspects of the three cities and the possible economic linkages between them. In this section we bring this information together to provide a summary snapshot or profile of each of the cities individually in particular highlighting the characteristics which distinguish them from each other.

9.2 City Profile - Auckland

Auckland dominates the AHT city-region in terms of population, employment, output and economic diversity. Auckland's relative economic strengths lie in business services and distribution. Auckland is beginning to exhibit the characteristics of a polycentric city, with developing centres towards the urban periphery located within a single labour market area and which is likely to be adding to the productivity benefits attributable to the economic scale attained by the region. Realistically, Auckland is New Zealand's only 'globalising' city and will continue to benefit from initiatives which support its increasing scale, density and economic diversity.

Table 9.1 Auckland Profile

Largest city in New Zealand	Population for the four cities of North Shore, Waitakere, Auckland and Manukau of 1.13 million in 2006. This compares with 0.35-0.40 million for Wellington and Christchurch.
Key service sector location	Total employment of 122,000 out of national total of 309,000 in 2006. Particular concentration in finance and insurance sector with 42 per cent of total national employment. Provision of advanced business and financial services over large areas of New Zealand.
Key manufacturing centre for New Zealand	Total employment of 61,000 about 30% of national total.
Distribution centre for New Zealand	High proportion of workers in distribution sector - 9% of total workforce compared to 6 % in Hamilton and Tauranga (4 jobs per 100 residents compared to 3 for Hamilton and 2 for Tauranga). Volume of retail distribution from Auckland (NFDS) - 3.5 million tonnes per year to areas away from Auckland in 2006-07 out of total of total interregional movements of about 5.3 million tonnes (2/3 of national total).
High levels of earnings and productivity	Average earnings about 125% of national average.
Highly educated labour force	26 per cent of population with a degree or similar. 0.9 per cent with PhDs.

Large market for goods and services	Total population in Auckland Metro of 1.13 million (2006) with growth of 200,000 or 21 per cent between 1996 and 2006.
Major port both for international and coastal shipping	International trade in 2010 - 6.3 million tonnes. Largest port by value of cargo handled - $25 billion out of total of $81 billion in 2010. Centre of coastal shipping in New Zealand.
Major international airport	7.4 million international passengers (70% of international visitors to NZ) makes Auckland the second busiest international airport in Australasia. 5.6 million domestic passengers. Volume of airfreight of 165,000 tonnes (85 per cent of national total and second largest port by value of cargo handled ($13 billion). Only Auckland seaport bigger.
Major education centre with two large universities	University of Auckland is the top ranked university in New Zealand and has 39,000 students and 4,500 staff. AUT has 19,000 students.

9.3 City Profile - Hamilton

Hamilton is a maturing city which has grown from its core function as a rural service centre. The broader Waikato region's economy is based around primary production with dairy farming being the main activity. Stable employment and relatively stable earnings in the dairy sector provides a strong foundation for the economy of greater Hamilton. From this stable and affluent economic base, economic development has taken a number of paths for Hamilton.

Firstly, the demands of primary producers for machinery and equipment has provided an opportunity to leverage upwards into tertiary activities. As a consequence, related manufacturing and engineering activities are also now an important part of the Hamilton economy, for instance stainless steel manufacturing which is widely used for dairy machinery has flourished in Hamilton.

A key step in Hamilton's economic development has been the generalisation of these tertiary activities, meaning that Hamilton is now a key location for metal based manufacturing activity that serves a wide range of different markets including for example aviation. However, it was the initial strength of demand from dairying in particular that allowed this sector to gain sufficient scale to expand into other markets.

A similar pattern is now being observed in the agri-science area where increasing activity in research and development associated with improving land output in the dairy sector is starting to provide opportunities in other sectors. Interview comments along these lines included:

- "Cow city! But growing manufacturing (e.g. stainless steel) and technology sector to support agricultural sector"
- "Agri–tech in Hamilton being generalised into other market opportunities e.g. supply chain and logistics teaching built from agricultural base."

- "Opportunities to generalise new technology developments and open up new markets beyond agri-sector – how to do this is key for Hamilton."

This pattern of 'smart' development is leading to a strong perception that Hamilton is a 'smart city'. For example, responses from interviewees included:

- "Lot of smart, well connected people in Hamilton. Need job opportunities for these people. The Health sector is a big opportunity in city, education too, but need specific interests but neither are big employers in the city. Need more big employers/private sector opportunities."
- "Needs to be a city where 'clever people' want to live and work. It needs to provide opportunities, amenity and culture. Needs to be a 'good city' when compared internationally."

There is a significant depth of public infrastructure in Hamilton including the University of Waikato, WINTEC and Waikato Hospital.

There are a number of opportunities facing Hamilton. One is the process of generalising technology developments for dairying, as happened previously in metals and machinery, moving beyond the dairy sector and opening up new market opportunities.

A second observation is that much of the observable knowledge creation in Hamilton is primarily associated with the process of increasing the efficiency of primary production 'on the farm' in many cases allowing existing products to be created more cheaply or effectively. Although this is clearly important as cost efficiency has been a key driver of New Zealand's success in primary production, there are both limitations to this approach and also there are other potentially valuable opportunities to move up the value chain that may be being overlooked.

Table 9.2 Hamilton Profile	
Key employment location for the Waikato	50,000 jobs out of regional total of 128,000.
Business service centre for Waikato	55 per cent of employment in finance and insurance and property and business services.
Major regional manufacturing centre	7,000 out of regional total of 16,000 (45 per cent of regional total). Specialisation in metals and machinery.
Research centre for agriculture	Innovation Waikato and AgResearch leading R & D in dairy production.
Aeronautics centre	Production of over 1000 aircraft with a further 1000 expected in next 7-10 years. Linkages with advanced components manufacture in Bay of Plenty (especially Titanium products).
Well educated labour force	17 per cent of population with a degree or similar. 0.8 per cent with PhDs.
Freight hub for local dairy industry and potential for others	Located at junction of national rail lines (North Island Main Trunk Line and East Coast Main Trunk Line) and

	consolidation point for dairy processing.
Education and health centre	University of Waikato 13,000 students. WINTEC – vocational training. Major Tertiary Hospital supplying services to other regions including Bay of Plenty.

9.4 City Profile - Tauranga

Tauranga is a less well developed economy than either Auckland or Hamilton, in the sense that it lacks scale of public infrastructure (e.g. tertiary education facilities) and does not have a long economic history as a rural service centre to provide a strong foundation in supporting activities, such as the manufacturing sector in Hamilton.

Comments we elicited from interviewees regarding their views of Tauranga's economic features included:

- A notable difference with Hamilton and Auckland was that Tauranga is still a "new city, with recent high growth but still not well established, and not characterised by well developed business relationships." "It lacks depth." Whereas Hamilton was seen to be "better established, born out of agriculture, but now diversifying" and with a 'lot of smart, well connected people."
- But, it was noted by many respondents that Tauranga was becoming more self-contained as a city.

Recent population growth has driven growth in the economy and a healthy construction sector reflects the strong demand for new residential property and infrastructure required to keep pace with this population growth. However, a noticeable feature of this growth is that it appears to be related to lifestyle choices or housing affordability. Tauranga does exhibit over representation of residents on fixed incomes and with low levels of educational attainment compared to the population in general.

Future opportunities for Tauranga would appear to be most likely to be realised from the development of a strong economic base that reflected Tauranga's role within it's own region. Emphasising the lifestyle advantages of the area are important but looking more deeply into developing a strong service centre for the Bay of Plenty is also important. As one interviewee noted, "the recent growth of the economy has been driven by population growth, largely perceived to be retired people." Another respondent suggested that " an increase in job opportunities is necessary for attracting for young professionals. There is strong demand as a lifestyle location but Tauranga need more jobs. Focus needs to be on the supply side: research, attracting investment and new firms."

Supporting this through targeted expansion in tertiary education leading onto potential opportunities for skilled employment in marine, metals, health, aquaculture and business services would be a viable growth path. This process is already underway, as the following examples provided by an interviewee illustrate:

- Work is underway to establish a university tertiary and research campus in Tauranga's city centre with a strong emphasis on science and technology, in a

partnership between University of Waikato, Bay of Plenty Polytechnic and Te W\hare Wananga o Awanuiarangi.

- A research centre has been established at the Bay of Plenty Polytechnic providing investigating the manufacturing techniques required to turn titanium and other metal powder into metal products.
- Discussions are underway with the Bremen Institute for Production and Logistics (BIBA)[75] to establish a partnership to support the work of the Bay of Plenty Polytechnic's centre of expertise in transport and logistics.
- Aquaculture has been identified as a key growth sector. A centre of research excellence has been established in Tauranga involving the University of Waikato and the University of Bremen. Intercoast has interdisciplinary researchers from the two universities working together on projects that focus on the Bay of Plenty coast and inner continental shelf, and comparable areas of the North Sea. Up to 40 PhD students and post doctoral fellows are expected work on the projects over the next nine years. This is New Zealand's first international PhD programme in this field of study.
- Bay of Plenty software development company, Pingar LP, has partnerships with the University of Waikato, University of Wales and Auckland University of Technology to investigate the establishment of a centre of excellence in Tauranga in the area of advanced internet search technologies.
- The Bay of Plenty Clinical School (established by the DHB in 2007) over two campuses in Tauranga and Whakatane. Allows students to complete practical study in all health-related disciplines (medicine, nursing and allied health). An agreement has been reached with Auckland University for the placement of fifth year medical students.

Table 9.3 Tauranga Profile

Rapidly growing population driven by lifestyle choices	Increase of 33% between 1996 and 2006 compared to 21 per cent for Auckland and 18 per cent for Hamilton. What was previously a holiday destination becoming seen as a retirement destination. Proportion of population over 60 22.5% compared to national average of 17.8% and 13-14% in Auckland and Hamilton. Further Population growth may be limited by lack of employment prospects for skilled workers.
Relatively unskilled labour force	10% of population with a degree or similar.

[75] Bremen University (an internationally recognised leader in production and logistics systems research) established BIBA. It is one of the largest research institutes in Germany with around 100 researchers working in areas such as logistics, production planning, production technology, machatronics, robotics, scientific engineering, computer science, electro technology and similar scientific disciplines.

	0.2% with PhDs.
Developing primary sector in the rural hinterland	Logging, horticulture and potentially aquaculture providing a base level of primary production activity but does demonstrate the longevity or stability of dairying in the Waikato.
Transport and logistics	Port of Tauranga provides key export and import gateway. serving a wide hinterland. Largest NZ port in terms of volumes handled: 11.3 million tonnes in 2010 mainly serving primary products such as logs and timber, kiwifruit, and dairy products and also containerised commodities, especially to and from Auckland market. Third largest port in terms of value (just behind Auckland Airport). Metroport Inland Port serving south Auckland area with rail connection. Handled 170,000 TEUs in 2008, out of a port total of 580,000 TEUs 40 per cent of port traffic by rail.
Some tertiary education establishments	Relatively low educational attainment but growing awareness of the need for skilled workers and educational facilities with noted developments in targeted tertiary activities.

10 Modelling Current Patterns of Activity and Future Growth

In this section we use modelling work to predict the impacts of potential growth within the AHT region using broad growth scenarios, a business as usual scenario and a range of scenarios considering alternative employment distributions (explained in section 10.4). This helps us to consider whether future growth is likely to alter and/or extend the economic structures of each city-region, and the wider economic geography of New Zealand, the potential impacts on flows between the cities, where growth will be most likely to be centred under a Business as Usual scenario and what would the impacts of alternative scenarios for the future on the level of economic activity in the AHT cities.

10.1 Population growth

Firstly, estimates of population growth for the study area have been made based on projections published by Statistics NZ. For this study we have used the high growth forecasts which are available to 2031 and have then assumed that the growth predicted for the final 5 years within this period between 2026 and 2031 continues at the same linear rate to 2041. The use of the high forecasts is considered appropriate particularly for the study area in light of the substantial growth that has occurred over the past, which has typically been higher than the Statistics NZ medium forecasts. The increases in population that result are set out in Table 10.1:

Table 10.1 Forecast population growth rates for Auckland Metro, Hamilton and Tauranga 2006-2041(based on Stats NZ high forecasts)

Area	Population in:-					Average growth rate pa 2006-2041
	2006	**2011**	**2021**	**2031**	**2041**	
Auckland Metro	1,126,000	1,311,400	1,577,200	1,854,100	2,131,300	1.7%
Hamilton	129,000	148,600	175,900	204,100	232,500	1.6%
Tauranga	104,000	120,100	147,300	175,800	204,400	1.9%
Sub total	1,359,000	1,580,100	1,900,400	2,234,000	2,568,200	1.7%
Total NZ	4,028,000	4,522,720	5,176,160	5822110	6,459,750	1.2%
3 cities as per cent of NZ	34%	35%	37%	38%	40%	

Source : Consultants Estimates

The three cities are forecast to continue to grow more strongly than the country as a whole. As a consequence their share of total NZ population is expected to increase from 34 per cent in 2006 to 40 per cent in 2041. The share of the three regions in which these are located (Auckland, Waikato and Bay of Plenty) is similarly forecast to increase from 49 per cent in 2006 to 54 per cent in 2041, demonstrating the importance of this area.

10.2 Labour force growth

In order to estimate the growth in the labour force and the level of employment we have assumed that overall participation rates would remain broadly the same as they are today. As a result the employment growth figures that result would be similar to those

derived above for the population forecasts. While employment has grown faster than the population in general over the past, it has been assumed the scope for additional participation in the labour force is now more limited, particularly as the population ages and as a result population and employment will therefore grow at the same rates. On this basis the employment in the three cities is forecast to increase as set out in Table 10.2, although it should be recognised that given the period over which forecasts are made the results are subject to considerable margins of error:

Table 10.2 Forecast Growth in Employment 2006-2041

	Employment in:-		
AHT Only	2006 (1)	2041	Forecast growth
Auckland Metro	478,860	843,000	76%
Hamilton	60,816	105,000	73%
Tauranga	44,127	84,000	91%
Total	583,803	1,032,000	77%
Wider Auckland	57,918	111,000	92%
Other Waikato	83,337	108,000	30%
Other BOP	59,632	77,000	29%
NZ Total	1,667,397	2,568,000	54%

Source: Consultant's modelled estimates .

Note: There are a number of definitions of the numbers employed. This table is based on the numbers employed as recorded in the 2006 Census and therefore includes full and part time workers. The numbers derived are therefore slightly different to those set out elsewhere in this report which reflect different measures.

10.3 Modelling the effects of growth on productivity and output

The productivity of the labour force is expected to grow over time, driven by a number of factors. These include:

- The movement of employment between areas of different levels of productivity.
- Background growth in labour productivity caused by improved use of capital and other factors.
- Agglomeration impacts as effective employment density changes with the overall change in employment levels and also as the level of service of the transport network changes.

In order to assess the third of these effects we have developed a Regional Agglomeration Model. This follows the approach developed by NZTA and now incorporated in Volume 1 of their Economic Evaluation Manual (EEM) and uses the various parameters developed for this approach.[76]

10.3.1 The Base Case

The area used for the agglomeration modelling covers all the North Island regions included within or adjoining the main study area of Auckland, Waikato and Bay of Plenty.

[76] The development of this model is described in more detail in Appendix 5.

In 2006 the represented employment of about 1.05 million and is forecast to increase to about 1.95 million by 2041, an average annual rate of increase of about 1.8 per cent.

Over this period from 2009 to 2041 GDP per capita is forecast to increase by an average of about 1.8 per cent per year, giving a total growth of about 77 per cent. This increase is assumed to cover the three factors identified above, movement to more productive jobs, background increases in labour productivity and agglomeration impacts from a denser clustering of employment. Initial analysis of the base case position indicated that over the period to 2041, agglomeration impacts would increase in GDP by the order of 3.5 per cent. The background economic growth excluding these would amount to about 71 per cent overall or about 1.7 per cent per year.

This combination of the employment growth rates as set out in Table 9.2 combined with a background growth rate in per capita GDP of about 1.7 per cent generating agglomeration benefits of about 3.5 per cent overall therefore forms the base case against which a number of alternative scenarios have been assessed. The base case forecasts of GDP for the three cities as set out in Table 10.3:

Table 10.3 Base Case Forecast Growth in GDP 2009-2041 ($billions)[77]

AHT Only	Total Estimated GDP in 2009 (2009 values)	Total GDP in 2041 excluding agglomeration benefits	Agglomeration benefits in 2041	Total GDP in 2041 including agglomeration benefits
Auckland Metro	50.0	142.9	5.4	148.4
Hamilton	5.1	14.4	0.5	14.9
Tauranga	3.7	11.3	0.4	11.8
Total	58.82	168.7	6.4	175.1

Source: Consultants Estimates

The agglomeration benefits, although small in percentage terms, represent a substantial impact, raising annual GDP for the three cities by $6-6.5 billion by 2041.

10.4 Scenario testing

Following on from the estimation of the 2041 Base Case, a number of scenarios using alternative employment and transport network assumptions have then been tested using the agglomeration model. These scenarios comprise:

- **Scenario 1 Low employment growth:** Employment growth in the three cities is assumed to be at the lower level predicted for NZ as a whole of 54 per cent for the period from 2006 to 2041, rather than the higher figures set out in Table 10.2.
- **Scenario 2 Relax Auckland's Metropolitan Urban Limits (MULs)**:: As a proxy for the relaxation of the Auckland MULs employment growth has been

[77] The process used to estimate these figures gives a lower estimates of regional GDP than the figures set out in Table 6.1, but is considered to provide a reasonable basis for the estimation of the differences in the agglomeration benefits and total GDP associated with alternative scenarios.

spread more widely across the Auckland region than in the Base Case scenario. For this we have assumed that employment in Auckland city would be 100,000 less than assumed in the Base Case with this distributed equally between the other constituent authorities.

- **Scenario 3 Concentration of employment growth in Auckland:** Effects of additional employment of 100,000 in Auckland in 2041 concentrated in the centre of the city.
- **Scenario 4 Concentration of employment growth in Hamilton and Tauranga:** Effects of employment increases of 100,000 in Hamilton and Tauranga, with this split equally between the two.
- **Scenario 5 Effects of growth of sectors under the government's Economic Growth Agenda**: We have only been able to model these effects very approximately by assuming that with the national Economic Growth Agenda sectors the importance of interaction and the resulting agglomeration elasticities would increase. For this we have therefore assumed that the average agglomeration elasticity for the Auckland Metro cities increases to 0.087, the value estimated for the finance and insurance sector.
- **Scenario 6 Inter-regional travel time savings:** Reducing the travel times **between** the three cities to improve accessibility within the region as might be achieved with specific projects. These have been estimated on the basis of the assumed travel time savings for the Waikato Expressway and a notional improvement in the route across the Kaimai Ranges on SH29 into Tauranga. The assumed travel time reductions are set out in Table 10.4

Table 10.4
Assumed Journey Time Improvements on Improved Road Links in the AHT Study Area

Waikato Expressway	
North of Hamilton	15 minutes
Hamilton Bypass	15 minutes
South of Hamilton	5 minutes
Total	**35 minutes**
SH29 Kaimai Improvement	**15 minutes**

- **Scenario 7 Intra-regional travel time savings:** Reducing travel times generally **within** the three cities to improve internal movements and commuting.

The baseline forecasts indicate that GDP in the AHT cities and in their regions is expected to grow substantially between 2009 and 2041. These are driven by increases in overall employment, with an increasing proportion in locations with higher value added where there is the opportunity to gain from the benefits of agglomeration resulting from the higher levels of activity. The key factors emerging from the examination of the scenarios are:

- GDP in the AHT cities (and regions) is very sensitive to the level of employment growth and its distribution.
- The low rate of growth tested in Scenario 1 would reduce GDP in the 3 cities by about 13 per cent

- The more even spread of employment across the Auckland region tested in Scenario 2 analogous to the relaxation of the MULs would reduce GDP by 8 per cent. Across the 3 regions as a whole this would reduce output by 3 per cent, despite total employment being the same as the base
- An increase in employment in Auckland City would increase GDP in the AHT cities by 12 per cent. The same level of increase in Hamilton and Tauranga would give an increase of 8 per cent.
- The modelling of the EGA scenario has suggested that this would result in a relatively small increase in GDP. This has however only been modelled very approximately and this figure may be underestimated possibly substantially. Further work would be required to investigate this further.
- The effects of increases in transport accessibility on overall regional output are relatively small (but possibly significant in relation to the investment undertaken). The benefits from improvements to intra-urban accessibility are much larger than those from improving inter-urban connections.

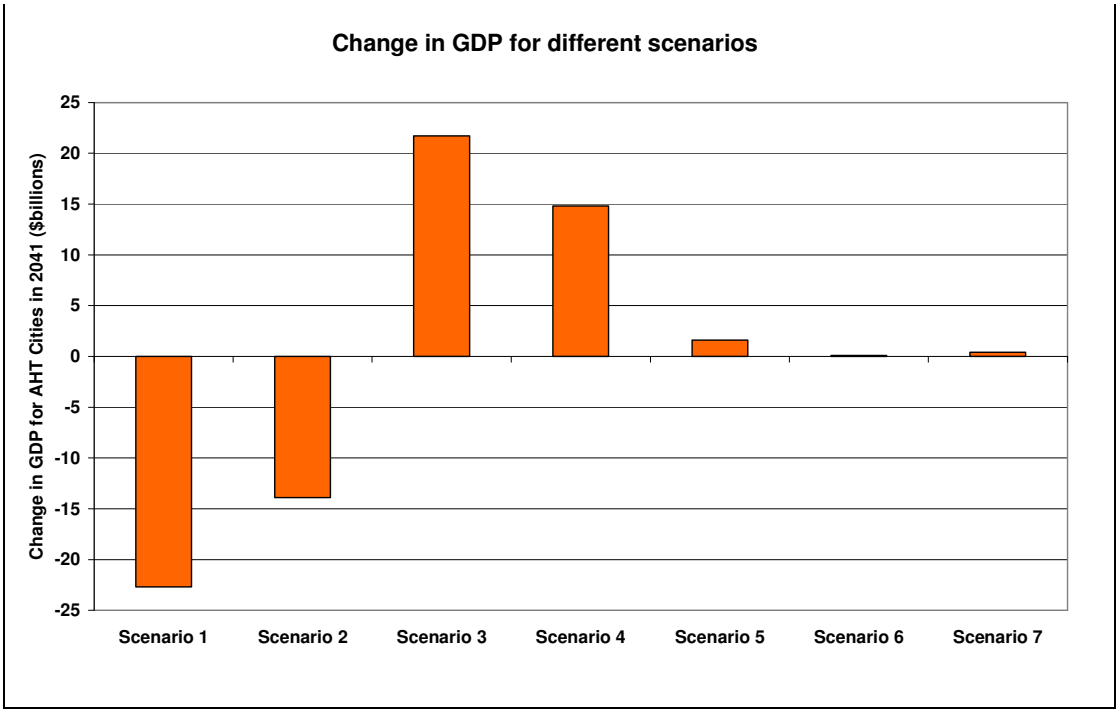
The model forecasts indicate that there are substantial benefits from encouraging employment expansion in the three cities and in particular in concentrating this in central Auckland (Scenario 3) rather than distributing this more widely across the Auckland region as might result from a relaxation of the MULs. In addition while there would be benefits from encouraging growth in Hamilton and Tauranga these would be smaller than the benefits from concentrating this in Auckland.

While the numbers from this exercise should be regarded as illustrative rather than precise, they do indicate that there appear to be substantial benefits from concentrating employment in the central areas of Auckland rather than spreading it more widely across the region or switching this to Hamilton or Tauranga. The empirical results of this testing are set out in Table 10.5 and Figure 10.1 below:

Table 10.5 Results of RAM Modelling: Employment and GDP changes in the AHT Cities and Regions 2041

Scenario	Employment in AHT Cities	Total GDP in 2041 AHT Cities	
		Total Output ($bill)	% of Total in 2041
Current 2009	*583803*	*58.8*	*34%*
Position in 2041			
Base Case Total Employment and Output			
Base Case High Stats NZ growth	1032400	175.1	100%
Scenarios: Change from Base			
Scenario 1 Lower Growth Rate in employment in AHT cities	-131,000	-22.7	-13%
Scenario 2 Relaxation of MULs	-42,000	--13.9	-8%
Scenario 3 Increase of employment of 100,000 in Auckland City	+100,000	+21.7	+12%
Scenario 4 Increase of employment of 100,000 in Hamilton and Tauranga	+100,000	+14.8	+8%
Scenario 5 EGA scenario	0	+1.6	+1%
Scenario 6 Increased **inter**-urban accessibility	0	+0.1	+0%
Scenario 7 Increased **intra**-urban accessibility	0	+0.4	+0%

Figure 10.1 Forecast Impacts on GDP in AHT Cities for Alternative Population and Transport Scenarios

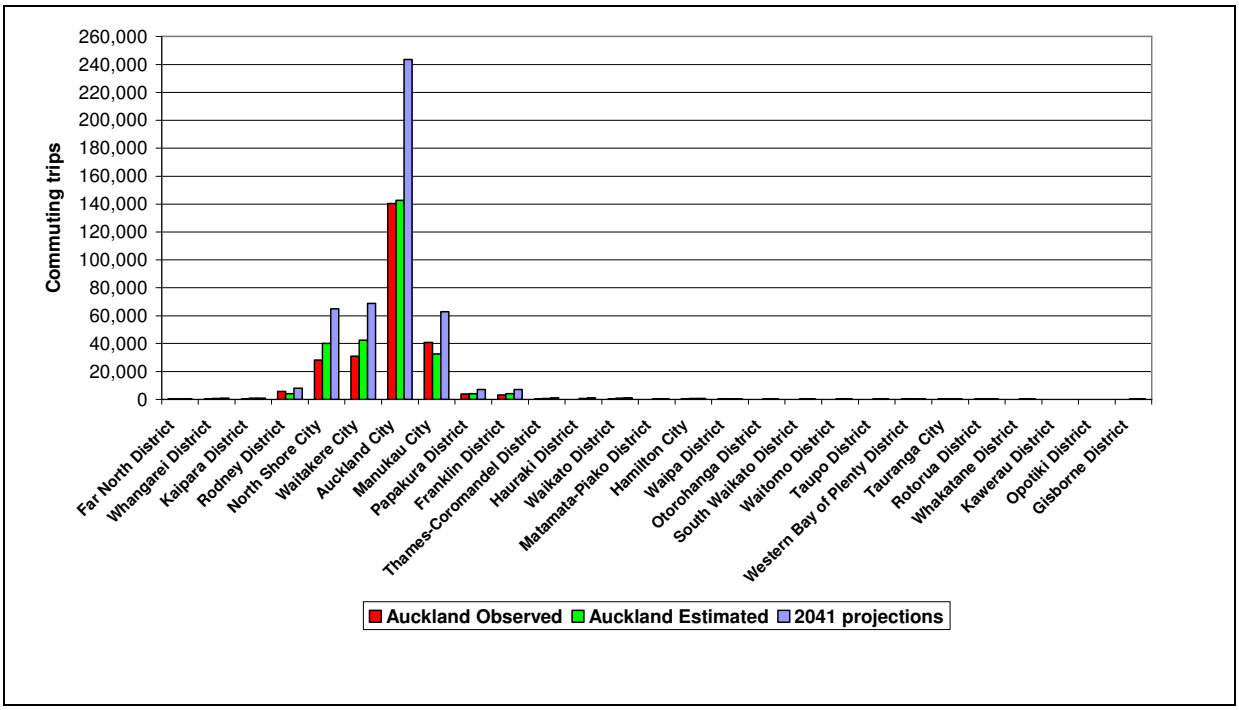


Overall, the results do appear to be fairly sensitive to the level and distribution of employment in the area which suggests that policies which can influence this may have a noticeable impact on the patterns and level of economic growth in the corridor.

10.4.1 Gravity modelling of commuting flows

A gravity model of commuting flows has also been developed and this is described in Appendix 6. In general this supports the findings that the labour markets for the three cities are essentially separate both in the base year of 2006 and even with the substantial growth forecast for 2041. As an example of this the pattern of commuting into Auckland City in 2006 and projected for 2041 is set out in Figure 10.2.

Figure 10.2 Commuting into Auckland 2006 and 2041



Source; Statistics NZ

While there is projected to be a substantial increase in the numbers commuting to jobs in Auckland City by 2041, the majority of employment will be filled by workers either from within Auckland City itself or from those coming from other parts of Auckland Metro or the Auckland region. While the numbers from outside will grow substantially the numbers will still remain a small proportion of the total for Auckland City, so there is little evidence that labour markets will become significantly more inter-connected.

10.5 The effects of agglomeration on economic growth and structure

Here we report the results of the modelling undertaken to determine how the AHT linkages might change productivity and impact on the New Zealand economy as a whole. Our analysis builds on the data collected in the earlier components of this study, and draws on city size, industry profile and postulated agglomeration effects. The general hypothesis is that if a city-system exists then the AHT cities are inter-connected in such a way that the agglomeration effects that each exhibit are greater than would be the case if they were separate, stand-alone entities.

We have tested Scenarios 1-5 to examine the impacts of alternative specific hypotheses about the location and magnitude of employment growth and the agglomeration effects consequent on that growth. We examine the impacts of the productivity benefits for the whole of New Zealand generated by these five scenarios compared to a 2041 Business As Usual (BAU) scenario using BERL's Computable General Economic (CGE) model of the New Zealand economy. The scenarios tested are summarised in Table 10.6:[78]

[78] BERL developed a BAU scenario for the New Zealand economy in 2021 using our CGE model, updated to 2026. This was prepared to analyse the impacts of immigration for Department of Labour (DoL), published in it *Economic Impacts of*

Table 10.6: Scenarios used for CGE Analysis

Scenario	1	NZ Average growth rates in employment in the AHT cities
	2	Redistribution of employment within the Auckland region to reflect the possible relaxation of the MULs
	3	Increase of employment of 100,000 in Auckland City
	4	Increase of employment of 100,000 in Hamilton and Tauranga split equally between the two cities
	5	Increase in value added activities in line with the sectors of national importance

Note: Fuller definitions of these scenarios are given earlier in this section

The agglomeration scenarios assume inward migration to the AHT triangle, as it maintains or improves its attractiveness to New Zealanders and to migrants. Increased net migration increases the population and employment in the AHT triangle and also gives rise to productivity benefits because of the greater clustering of the population.

The results let us compare the relative size of the agglomeration affects under the BAU and scenarios defined above. The estimated GDP impact is greater with the larger employment concentrations, and particularly reflects the effects of concentrating additional employment in Auckland City.

Table 10.7: Results of CGE Modelling of GDP Increases resulting from Agglomeration Impacts

	Scenario				
Impact of agglomeration	1	2	3	4	5
Additional productivity in AHT RAM Model Area	-0.94%	-0.27%	0.82%	0.54%	0.59%
Additional productivity nationally	-0.48%	-0.14%	0.42%	0.28%	0.30%
Impact on GDP (%diff from BAU)	-0.27%	-0.08%	0.31%	0.21%	0.22%
Impact in GDP ($billions)	-$1.3	-$0.4	$1.5	$1.0	$1.0

It should be noted that the CGE modelling results reported in Table 10.7 only incorporate the effects of the agglomeration benefits from the different employment levels and do not take into account the direct effects of the different employment levels. As a result they are not directly comparable with the figures set out in Table 10.5 but give a useful indication of the relative impacts of the different scenarios. Reducing employment growth or distributing activity within the Auckland region away from the central areas results in a loss of output. Increasing employment raises output, but effects are greater when activity is focussed in Auckland rather than in Hamilton and Tauranga.

10.6 Summary

We have used modelling to predict the impacts of potential growth within the AHT region using hypothetical growth scenarios. This helped us to consider:

- whether future growth is likely to alter and/or extend the economic structures of each city-region, and the wider economic geography of New Zealand;

Immigration Working Paper Series. We use this model for this project to examine the economic impacts of the shape of the economy in the BAU case compared to the agglomeration scenarios, combined with our 2041agglomeration scenarios. We implicitly assume that the economic structure and growth rates between 2026 and 2041 remain constant in each scenario. While the levels of particular economic variables will continue to change over this period, this lets us report the annual growth rates.

- what the expected impacts of potentially easier interactions, between these city-regions might be;
- where growth will be most likely to be centred under a Business as Usual scenario; and;
- what would the impacts of alternative scenarios for the future.

Firstly, we find modelling evidence which indicates the labour markets for the three cities will remain essentially separate, as they are now, even after the substantial growth forecast for 2041. This confirms that the three cities are unlikely to develop into a city-system, within the context of the definition we have applied, requiring an integrated labour market within a polycentric region.

Secondly, the forecast growth in employment in the study area will lead to increases in the GDP generated by Auckland, Hamilton and Tauranga. There are a number of factors contributing to this, including the relative growth of employment in more productive areas, general increases in productivity and also agglomeration effects as the numbers of workers accessible from particular centres increase. These are forecast to lead to a substantial increase in the output of the three cities between 2009 and 2041 with GDP increasing from about $60 billion in 2009 to $170 billion in 2041. Agglomeration benefits would comprise about $6.5 billion in 2041 or about 6 percent of the total increase. Of the total from the three cities, the majority (85 per cent) would come from Auckland Metro with about 15 per cent from Hamilton and Tauranga combined.

Thirdly, a range of alternative growth scenarios were developed to examine the impacts of different distributions of employment. These reveal the higher levels of productivity and output achieveable by concentrating employment in the central areas of Auckland rather than spreading it more widely across the region or switching this to Hamilton or Tauranga.

Finally, improving accessibility and reducing travel time between the cities would increase their interaction via flows of people and goods and lead to agglomeration benefits. To illustrate this the effects of the Waikato Expressway and upgrading SH29 over the Kaimais were examined. The agglomeration benefits for the projects are fairly substantial. For the Waikato Expressway these would have an NPV of about $600-650 million, and for the Kaimai upgrading an NPV of about $200 million. The benefits for these schemes mainly lie with the smaller cities, rather than for Auckland, reflecting the role that accessibility to Auckland and other destinations accessed via Auckland plays in the economic structures of Hamilton and Tauranga.

11 Key Findings

The purpose of this research project has been to test for the emergence of a 'city system' between the Auckland, Hamilton and Tauranga city-regions whilst the specific objectives of the study were:

- to identify the main economic connections between the AHT city-regions;
- the impact of growth of the AHT city system on the city-regions within it and the wider New Zealand economy; and
- to propose a range of actions to assist in lifting the productivity of the AHT city-system.

11.1 City regions

The vast majority of the literature relating to the growth of city-regions examines the case of an individual city or city-region which incorporates multiple economic centres, rather than considering the relationship between distinctly separate city-regions, which is in practice the case for the cities of Auckland, Hamilton and Tauranga , which form the focus of our study.[79]

The literature tends to focus on the potential benefits arising from metropolitan areas becoming increasingly decentralised,[80] the growth of edge cities[81] and the increasingly polycentric (multi-centred) nature of cities. Meijers and Burger (2010) note that a more polycentric region is likely to display higher labour productivity, which suggest that agglomeration externalities can spread over larger distances, and "may interact in regions where multiple urban places, and hence, multiple sources of agglomeration externalities, are co-located."[82] This aligns with the view of Phelps and Ozawa (2003) that external economies are not confined to a single urban core, but instead, are shared among a group of functionally linked settlements.[83] For the purpose of this analysis a 'city-system' is defined as:

> *"the sites of dense masses of interrelated economic activities that also typically have high levels of productivity by reason of their jointly-generated agglomeration economies and their innovative potentials."*[84]

However, a key issue for our study is over what distances might these effects be expected to remain real and are the three cities which form the focus of our study

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[79] For example, see Kloosterman, R.C, & Musterd, S. (2001).
[80] Riguelle, F., Thomas, I. and Ann Verhetsel, A. (2007) Measuring urban polycentrism: a European case study and its implications, Journal of Economic Geography, Volume7, Issue2, Pp. 193-215.
[81] Bontje, M. and Burdack' J. (2005) 'Edge Cities, European-style: Examples from Paris and the Randstad', Cities, Volume 22, Issue 4, August 2005, Pages 317-330.
[82] Meijers E J, and Burger M J, 2010, "Spatial structure and productivity in US Metropolitan areas" *Environment and Planning A* 42(6) 1383 – 1402. p1399.
[83] Meijers and Burger , 2010, Ibid. p1399.
[84] Scott and Storper,2003, Ibid. p7.

"functionally linked"? Even relatively close proximity between city-regions does not guarantee any significant degree of economic inter-action. However, in many developed countries the distances between these three cities would be likely to be regarded as quite high. The position is exacerbated in New Zealand because of the absence of rail connections which typically elsewhere would provide an alternative to roads, operating at high speeds and providing the opportunity to make productive use of the time spent travelling.

Notably, in a study which looked at strengthening the economic relationships between the two northern English cities of Manchester and Leeds it was noted that "these cities are of particular interest because, while both cities have recently experienced strong economic growth, existing research finds little evidence of interaction in terms of business connections or commuting, despite their geographical proximity."[85] The two cities are only 65 kilometres apart, are connected by the M62 motorway and have a direct rail link, which also connects both cities directly with each other's airports and yet, left to their own devices they had continued to grow in relative economic isolation being influenced by general national factors rather than more localised inter-regional considerations.

11.2 Identifying key economic linkages,

Looking at Auckland, Hamilton and Tauranga, with the exception of the movement of freight the three city regions appear to possess relatively insular economies from a transport perspective with a low level of interaction for both commuting and business travel.

Consistent with the view that the three cities are not closely located our analysis of economic linkages shows that the level of commuting between the cities is very low and in general the three cities are self sufficient with respect to employment opportunities.

The highest commuting flows by a substantial margin are found within each of the three cities and recent trends serve to reinforce this pattern. From a labour market perspective there are high levels of self sufficiency within each of the city-regions which is considered to be an important finding as labour mobility is one feature that theory suggests would be present within a functioning city system. Separate labour markets indicates that the three cities are unlikely to benefit from the sharing, matching and learning opportunities arising from deep and integrated labour markets. This is a core component underpinning the benefits of agglomeration which appears to be missing from the AHT region and which is demonstrated in the findings from the Regional Agglomeration model. This is an important finding. From a labour market perspective the three cities do not correspond with the definition of a functioning city-system.

This result suggested that any significant labour mobility into or within the AHT region is likely to be facilitated via migration between the three cities but again, our analysis suggests that this is relatively small, compared to inward migration from overseas for example. Inward migration has been a significant driver of population growth in Hamilton and Tauranga with about a third of the residents over 15 of each city in 2006

[85] The Northern Way and Spatial Economics Research Centre, (2009), Ibid. p3.

having relocated from outside the city over the preceding 5 years. For Auckland the figure is 24 percent. However, the data reveals that the single largest source of inward migration for Hamilton and Tauranga is from 'other NZ' locations, outside of the AHT region and for Auckland it is from overseas. In all three cities, therefore, movements from 'other parts of NZ' and overseas are substantially larger than the movements between the three cities. The effects of the economic linkages acting between the three cities through migration are therefore found to be relatively modest.

From a freight perspective important linkages do exist between the three city-regions. The highest freight flows are between Auckland and Waikato and Waikato and Bay of Plenty. Flows between Auckland and Bay of Plenty are fairly small. Freight movements in volume terms are dominated by the basic commodities such as aggregates, liquid milk and logs and timber products. These are typically generated in rural areas and may therefore not have any significant direct connection with the higher value added products typically generated by the cities. Auckland is the key distribution centre for retail and consumer goods and the Bay of Plenty and in particular the Port of Tauranga is a source of imported goods to be redistributed by facilities in Auckland.

Courier movements are often a manifestation of higher value interactions between areas with the movements of documents or specialised manufactured products. Within the AHT region, the highest flows of courier traffic are between Auckland and Waikato and Waikato and Bay of Plenty, with flows between Auckland and Bay of Plenty being relatively small.

11.3 Analysing the economic structure

Analysis of the economic structure of each individual city-region revealed further strong evidence of the high degree of separation between the three cities

Importantly, the industry profiles for Auckland and Hamilton suggest they are large, reasonably independent metropolitan centres. This is apparent in the larger clustering of employment in their largest industries (58% in both cases). Auckland has a cluster of business services and acts as a national centre for such activity. In one interview with a major bank a staff member explained how Auckland is critical for generating ideas, innovations and new products through the high concentration of skills and staff turnover, and these sentiments and the importance of the linkages with Auckland were also expressed by a number of other interviewees outside this sector. The finance and insurance industries have grown their share of the areas GDP from 6.2 per cent in 1996 to 10 per cent in 2009. This industry is of particular interest as apart from the Auckland Metro area it is shrinking in the other areas and is also characterised by a high contribution per worker. This is one of the few clear examples of Auckland's specialisation. While Hamilton and Tauranga have a smaller share of their employment in business services, their levels are similar to other provincial city economies and there is no evidence of any significant form of "special relationship".

Hamilton's profile differs from the smaller provincial economies. It has a clustering of activity in higher value and servicing sectors such as manufacturing, distribution and wholesale trade, and business, community or personal services. Hamilton has its own

strong economic base in supporting the primary production sector and this has enabled its diversification into manufacturing.

Tauranga is more similar to provincial centres such as Palmerston North or Napier/Hastings, with 54 per cent of its employment in its largest industries, and a broad spread across its other industries. Tauranga and Whangarei have reasonably similar sector profiles. They have less than the national average level of employment in the primary and financial sectors, and above average employment in the construction and wholesale/retail trade sectors. This suggests that both these economies sit at an intermediate level in the settlement hierarchy, but with some reliance on Auckland (or Hamilton in Tauranga's case) for higher value tertiary services.

Overall, from the analysis of economic structure we do not find a strong case for the emergence of a city-system between the three city-regions. Rather, we have confirmed that each city is overwhelmingly independent of the others and where economic linkages do exist, they tend to be of a one-way nature.

11.4 Levels of connectivity

We examine the nature of supply chains between the three cities in the AHT to shed more light on the economic the interactions in region. Movements of goods between the three cities is fairly easy to distinguish from the data, but the movement of services can only be identified on a notional basis.

Given the large number of activities undertaken in the region, the resulting supply chains are very complex. For freight, the key elements are:

- the role of Auckland as a key market and distribution centre for manufactured and other retail goods for the whole area;
- The links between Auckland and Tauranga for the movement of imports and exports to and from Auckland; and
- The movements of basic commodities from producers in rural areas to international and domestic markets via Tauranga and Auckland.

The Port of Tauranga provides an important transport connection but is essentially only a point of modal transfer within global supply chains. There are connections within the marine sector and advanced business services in Auckland but the fact remains that this is only a marginal component of Tauranga's economy. The relationship between Hamilton and Tauranga is in some ways somewhat more developed with increasing interactions in higher education and health services being developed in Tauranga by providers based in Hamilton. However, there is little labour market interaction observable between the two cities, reflecting the relatively poor roading connections which are in turn a consequence of local geography.

For business services Auckland is also the dominant location, although there is a substantial degree of self sufficiency in both Hamilton and Tauranga for all but the more specialised services. Auckland dominates the supply of educational and health facilities although again there has been substantial development of these in the Waikato.

11.5 Impacts of growth

We used modelling to predict the impacts of potential growth within the AHT region using hypothetical growth scenarios.

Firstly, we find modelling evidence which indicates the labour markets for the three cities will remain essentially separate, as they are now, even after the substantial growth forecast for 2041. This essentially confirms that the three cities will not develop into a city-system, within the context of the definition we have applied, requiring an integrated labour market within a poly-centric region.

Secondly, improving roading connections and reducing travel time between the cities would increase their interaction, increase flows of people and goods and lead to agglomeration benefits. The effects of the Waikato Expressway and upgrading SH29 over the Kaimais have been examined. The agglomeration benefits over the evaluation periods for the projects are fairly substantial. For the Waikato Expressway these would have an NPV of about $600-650 million, and for the Kaimai upgrading an NPV of about $200 million. The benefits for these schemes mainly lie with the smaller cities, rather than for Auckland.

Thirdly, the forecast growth in the employment in the study area will lead to significant increases in the levels of GDP generated by Auckland, Hamilton and Tauranga. There are a number of factors contributing to this increase, including the relative growth of employment in more productive areas, general increases in productivity and also agglomeration effects as the numbers of workers accessible from particular centres increase with a consequent growth in productivity. These are forecast to lead to a very substantial increase in the value of output of the three cities between 2009 and 2041 with GDP increasing from about $60 billion in 2009 to $170 billion in 2041, of which agglomeration benefits would comprise about $6.5 billion in 2041 or about 6 percent of the total increase. Of the total from the three cities, the majority (85 per cent) would come from Auckland Metro with about 15 per cent from Hamilton and Tauranga combined.

Finally, a range of alternative growth scenarios were developed to examine the impacts of different distributions of employment. These have emphasised the higher levels of productivity and output which would be achieved by concentrating employment in the central areas in Auckland rather than spreading it more widely across the region or switching this to Hamilton or Tauranga which would typically lead to lower levels of output.

11.6 Summary of the three cities

Auckland dominates the AHT city-region in terms of population, employment, output and economic diversity with relative economic strengths in business services and distribution. Auckland is beginning to exhibit the characteristics of a polycentric city, with developing centres towards the urban periphery located within a single labour market area and which is likely to be adding to the productivity benefits attributable to the economic scale attained by the region. Realistically, Auckland is New Zealand's only 'globalising' city and will continue to benefit from initiatives which support its increasing scale, density and economic diversity.

Hamilton is a maturing city which has built upon its primary function as a rural service centre. Stable employment and generally reliable earnings in the dairy sector provide a strong foundation for the economy of greater Hamilton. From this stable and affluent economic base economic development has taken a number of paths for Hamilton. Firstly, the demands of primary producers for machinery and equipment has provided an opportunity to leverage upwards into tertiary activities. As a consequence, related manufacturing and engineering activities are also now an important part of the Hamilton economy, for instance stainless steel manufacturing which is widely used for dairy machinery has flourished in Hamilton. A key step in Hamilton's economic development has been the generalisation of these tertiary activities, meaning that Hamilton is now a key location for metal based manufacturing activity that serves a wide range of different markets. However, it was the initial strength of demand from dairying in particular that allowed this sector to gain sufficient scale to expand into other markets. A similar pattern is now being observed in the agri-science area where increasing activity in research and development associated with improving land output in the dairy sector is starting to provide opportunities in other sectors. In this respect Hamilton's economy displays an increasingly national role.

Tauranga is a less well developed economy than either Auckland or Hamilton, in the sense that it lacks scale, public infrastructure (e.g. tertiary education facilities) and does not have a long economic history as a rural service centre to provide a strong foundation in supporting activities, such as that underpinning the manufacturing sector in Hamilton. The underlying economic foundations for Tauranga are comparatively weaker, in part caused by the relative remoteness of the city from other major areas of economic activity and in part by the limited opportunities for larger scale value added activities linked with production in the city or its rural hinterland. Recent population growth has driven growth in the economy and a healthy construction sector reflects the strong demand for new residential property and infrastructure required to keep pace with this population growth. However, a noticeable feature of this growth is that it appears to be related to lifestyle choices or housing affordability. While it is likely that there is an important role for Tauranga as a key service and possibly local manufacturing centre for the Bay of Plenty, this is likely to be more significant in a regional rather than a national context.

12 Implications for Policy

Finally, we use the report's findings to suggest a number of actions to improve the productivity of the AHT city region, without creating adverse social and environmental impacts on the city-regions within it and other regions in New Zealand. In our view, the main policy implications arising from this analysis include:

12.1 Support focussed economic development in Auckland

Our analysis strongly suggests that initiatives which support the increased scale, economic diversity and reduced isolation (internationally) of Auckland will be likely to lead to the highest levels of economic output both for the study area and for the country as a whole, when compared with initiatives which actively attract growth and economic activity away from Auckland. Examination of alternative growth scenarios for the AHT region confirms that in particular, increases in employment focussed in the centre of Auckland will have the potential to lead to a greater increases in output than the spreading of jobs either across the Auckland Region (as for example might be the outcome of a relaxation of the Metropolitan Urban Limits) or across the other two cities of Hamilton and Tauranga.

12.2 Support Hamilton and Tauranga as regional service centres

Although we have stressed the primacy of Auckland in the AHT region, Hamilton and Tauranga serve important roles as regional service centres. Hamilton is clearly better established in this role and also demonstrates a capacity to leverage off the provision of services to the dairy sector and expand into new sectors and markets, both domestically and internationally. Tauranga is much more a developing regional service centre, reflecting the more recent expansion of horticulture in the Bay of Plenty.

Measures to concentrate regional employment in these centres will provide a stronger economic base within the regions and the potential to generate a wider set of value added activities to support local activities. This will also support the increasing national role of specific activities within these centres, such as agri-science and metals manufacturing in Hamilton. Encouraging accessibility within these two cities would help to support this in initiative. Improved connections with Auckland could allow better interactions and knowledge sharing with the higher level service activities in Auckland and so help to support economic efficiency in the smaller centres. Improved broadband access might be one part of this in initiative.

12.3 Improve accessibility within the cities

Whatever future employment scenario eventuates, the three cities all have the potential to make an increasing contribution to the economic output of New Zealand through their increasing involvement in value added activities. The achievement of this, however, requires that the cities are able to develop efficiently and support areas of high density employment where the benefits of agglomeration can be achieved. This in turn requires that these places of work are accessible to a wide range of workers allowing a good match to be achieved between the skills available and required.

Transport links that provide improved accessibility within the cities without detracting from urban amenity will be critical and as the results of the modelling show, improving intra-urban movements generates higher returns, compared with the improvement of inter-urban links. However, this is not surprising. As we have said, the three economies are predominantly insular with most economic activity being associated with local rather than inter-regional movements. However, improving internal city links also would help longer distance traffic. For an inter-urban journey between central Hamilton and central Auckland about 30 per cent of the total time and distance would be on the urban networks of the two cities, where one would expect that the highest levels of congestion will be experienced. Therefore. Initiatives which improve accessibility within the cities can benefit both local and inter-regional economic activity.

12.4 Support the movements of freight between the three cities within the corridor

While there are substantial freight movements within the Auckland/Waikato/Bay of Plenty regions, many of these are generated in rural areas and so do not form part of inter-city trips. The main exceptions to this are the movements of exported and imported goods between Auckland and Tauranga, much of which travels by container, and the distribution of commodities from the key distribution centres in Auckland. The movement of export and import cargoes involves the use of both road and rail and additional capacity will therefore be needed to accommodate the anticipated increases volume of these. The growth of the cities will also give rise to increases in the volumes of goods needed to support the increased levels of commercial and personal activities and capacity both between the cities and within the cities themselves will be required to support this.

12.5 Knowledge sharing via education

We found considerable statistical and anecdotal evidence of a relative lack of educational opportunities at the tertiary level in Tauranga. We also observed a number of initiatives between tertiary providers from both Tauranga and Hamilton to address this deficiency. Often this was through the identification of particular niche areas where tertiary education opportunities could be aligned with economic opportunities, such as courses in supply chain logistics for example. Encouraging this type of activity will provide a good mechanism whereby knowledge sharing between the two cities can be fostered and Tauranga can benefit from the relative depth of educational provision available in Hamilton.

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APPENDICES

Appendix 1 – Population and Migration

This section provides detailed statistics on migration and educational attainment relating to migrants for the three cities.

Migration patterns for Auckland

More detail has been obtained on the ages and educational attainments of those migrating between the three cities and to the cities from overseas. The age distribution of migrants to Auckland, compared with the position for the resident population remaining from 2001 is set out in Table A1.1 and Figure A1.1:

Table A1.1
Migration to Auckland from Selected Areas 2001-2006 by Age of Migrant

Age	Residents in 2001	Migrants from		
		Hamilton	Tauranga	Overseas
15-19 Years	9.9%	8.8%	14.0%	10.2%
20-24 Years	10.2%	23.2%	23.4%	14.2%
25-29 Years	9.1%	23.1%	11.0%	14.4%
30-34 Years	9.9%	12.2%	9.3%	17.3%
35-39 Years	10.4%	8.1%	8.1%	13.6%
40-44 Years	10.4%	6.3%	7.4%	10.6%
45-49 Years	9.1%	5.6%	5.1%	7.2%
50-54 Years	7.5%	4.2%	5.4%	4.0%
55-59 Years	6.6%	3.1%	4.8%	2.6%
60-64 Years	4.9%	1.9%	2.5%	2.0%
65 Years and Over	12.0%	3.6%	9.0%	3.8%
Total	100.0%	100.0%	100.0%	100.0%

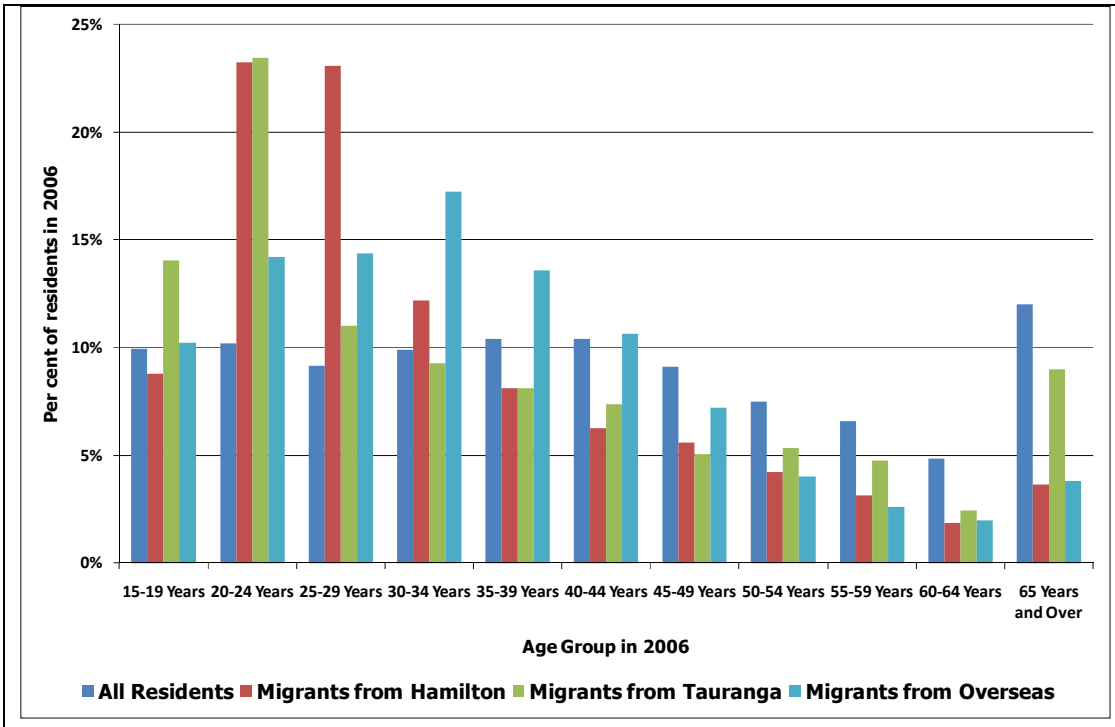


Figure A1.1
Auckland Metro Residents 2006 by Selected Areas of Residence in 2001 and Age
(Per cent of total in group all ages)

Comparing the patterns of migration with those of the residents of the area in 2001 remaining in 2006, the key points which emerge are:

- Migrants from Hamilton to Auckland are typically concentrated in the age groups from 20 to 34, which account for 58 per cent of the total, compared to about 30 per cent in this age range for residents.
- There are relatively high shares of migrants from Tauranga to Auckland in the younger age groups between 15-39, and particularly in the 20 and 24 age groups, which in part may reflect students attending the tertiary educational establishments in Auckland.
- Compared to the other groups of migrants identified, there are also relatively high proportions of migrants from Tauranga to Auckland in the older age groups from 50 upwards.
- For migrants from overseas, there are higher proportions in all the younger age groups from 15 to 44 years, and given the size of these movements these make up an important contribution to growth in these age groups in Auckland.

The level of educational attainment for the different classes of migrants and for those remaining in the Auckland area is set out in Table A1.2:

Table A1.2 Educational Attainment for Auckland Residents in 2006 by Residence in 2001							
Source of Migrants	**Total in 2006**	**Level of Educational Attainment in 2006**					
		No Qualification	**Level 1-4 Certificate**	**Level 5-6 Diploma**	**Level 7 and above**	**Not Elsewhere Included**	**Total Defined**
Residents remaining from 2001	614181	20.3%	47.0%	8.9%	17.7%	6.1%	100.0%
Hamilton	3549	9.0%	39.1%	7.5%	41.3%	3.2%	100.0%
Tauranga	2076	13.7%	51.9%	10.4%	18.9%	5.1%	100.0%
Overseas	133470	7.4%	46.3%	9.6%	30.7%	5.9%	100.0%

Migrants to Auckland from Hamilton and from overseas typically have high levels of educational attainment as measured in terms of the proportions with Level 7 education or above. For Auckland the position that results is of relatively high inflows of younger workers from the three areas identified in the 20-29 age group, high inflows of workers from overseas in the age groups up to 49 and also, and possibly surprisingly, a relatively high inflow from Tauranga from about 50 upwards.

Migration patterns for Hamilton

A similar analysis has been undertaken for Hamilton. The distribution of residents and migrants by age is set out in Table A1.3 and Figure A1.2:

Table A1.3 Migration to Hamilton from Selected Areas 2001-2006 by Age of Migrant				
Age	**Residents in 2001**	**Migrants from**		
		Auckland	**Tauranga**	**Overseas**
15-19 Years	10.9%	8.9%	18.9%	9.8%
20-24 Years	11.7%	13.5%	27.1%	20.6%
25-29 Years	8.7%	15.8%	10.8%	16.8%
30-34 Years	8.2%	15.6%	7.9%	15.1%
35-39 Years	8.4%	13.7%	7.1%	11.9%
40-44 Years	8.5%	8.7%	5.8%	9.1%
45-49 Years	8.2%	6.2%	4.2%	6.2%
50-54 Years	7.3%	4.3%	3.4%	3.8%
55-59 Years	6.5%	3.4%	3.2%	2.5%
60-64 Years	4.9%	2.9%	2.1%	1.6%
65 Years and Over	13.7%	6.9%	9.7%	2.7%
Total	100.0%	100.0%	100.0%	100.0%

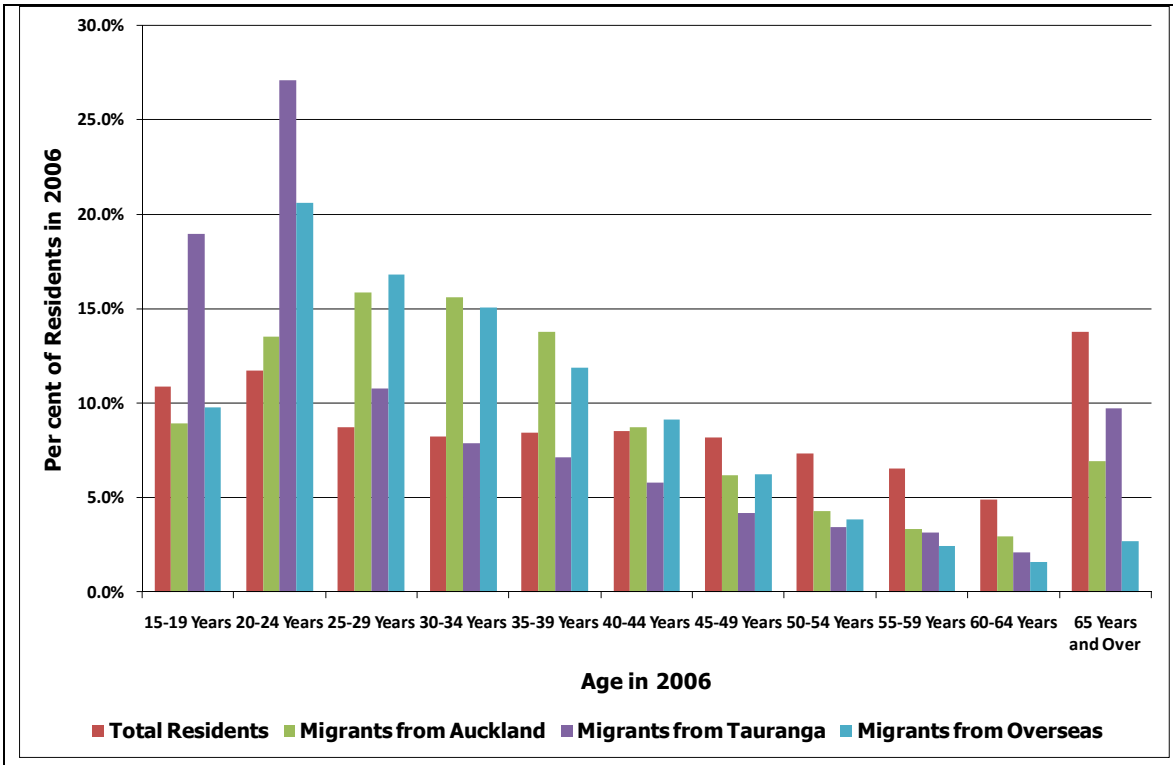


Figure A1..2
Hamilton Residents 2006 by Selected Areas of Residence in 2001 and Age Group
(Per cent of total in group all ages)

The key points revealed by the table and figure include:

- There are relatively large numbers of migrants to Hamilton from Tauranga in the 15-24 age group, possibly in part reflecting the numbers of students attending the University of Waikato and Wintec.
- There are relatively high proportions of migrants to Hamilton from Auckland and from overseas in the age groups from 25 to 39 and with relatively low proportions from about 45 onwards.
- The proportion of migrants to Hamilton from Tauranga in the highest age group is somewhat lower than that for the resident population but is higher than those for migrants from Auckland or from overseas.

The educational attainment of migrants to Hamilton and of Hamilton residents is set out in Table A1.4:

Table A1.4 Levels of Educational Attainment for Hamilton Residents in 2006 by Residence in 2001							
Source of Migrants	Total in 2006	Level of Educational Attainment in 2006					
		No Qualification	Level 1-4 Certificate	Level 5-6 Diploma	Level 7 and above	Not Elsewhere Included	Total Defined
Residents remaining from 2001	61887	23.7%	45.0%	9.2%	16.3%	5.8%	100.0%
Auckland	2859	15.4%	46.2%	8.7%	25.6%	4.1%	100.0%
Tauranga	1137	16.6%	58.6%	7.7%	13.5%	3.7%	100.0%
Overseas	10521	7.6%	49.0%	9.1%	29.0%	5.3%	100.0%

Again a similar picture emerges as for Auckland, with a relatively high level of educational attainment (proportion with Level 7 or above) for those migrating from Auckland and from overseas into Hamilton and a relatively low level of attainment for those migrating from Tauranga.

Migration patterns for Tauranga

The age distribution of migrants to Tauranga, compared with the position for the resident population remaining from 2001 is set out in Table A1.4 and Figure A1.3:

Table A1.4 Migration to Tauranga from Selected Areas 2001-2006 by Age of Migrant				
Age	Residents in 2001	Migrants from		
		Auckland	Hamilton	Overseas
15-19 Years	8.4%	4.6%	6.8%	8.1%
20-24 Years	6.7%	5.1%	13.6%	6.9%
25-29 Years	6.5%	10.2%	15.0%	14.1%
30-34 Years	7.8%	14.0%	11.4%	18.6%
35-39 Years	8.9%	13.6%	10.6%	15.3%
40-44 Years	9.2%	10.4%	7.2%	10.9%
45-49 Years	8.8%	6.5%	6.6%	7.5%
50-54 Years	7.9%	6.2%	5.8%	5.4%
55-59 Years	7.4%	6.6%	7.0%	3.9%
60-64 Years	6.4%	6.6%	5.0%	3.7%
65 Years and Over	22.0%	15.9%	11.0%	5.7%
Total	100.0%	100.0%	100.0%	100.0%

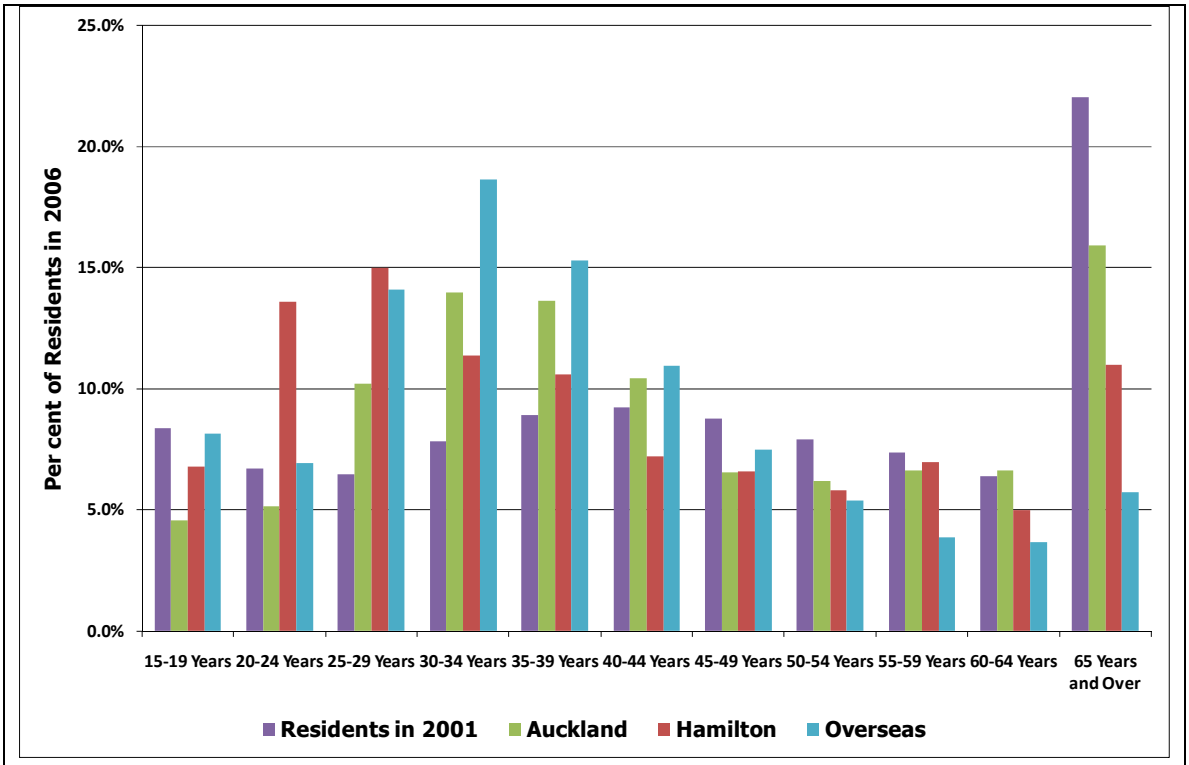


Figure A1..3
Tauranga Residents 2006 by Selected Areas of Residence in 2001 and Age Group
(Per cent of total in group all ages)

The key points emerging from the examination of the position for Tauranga include:-

- There is a relatively high proportion of the resident population in the highest age group of 65 or more. While there is also a high proportion in this age group migrating from Auckland to Tauranga this is less than the proportion for residents.
- There are relatively high proportions of migrants to Tauranga from Auckland in the age groups from 25 to 39 (or even 44) compared to the resident population. The particular impact of migration from Auckland to Tauranga can therefore be observed at two positions in the age range distribution, at this middle area as well as in the highest age group.
- Similarly the highest relative shares of overseas migrants are experienced in the 25 to 44 years age group.
- For migrants from Hamilton the highest proportions relative to the age distribution of residents are also felt for those in the relatively young age groups from 20 to 39.

The levels of education for the different groups are set out in Table A1.5:

Table A1.5 Levels of Educational Attainment Tauranga Residents 2006 by Residence in 2001							
Source of Migrants	**Total in 2006**	**Level of Educational Attainment in 2006**					
		No Qualification	**Level 1-4 Certificate**	**Level 5-6 Diploma**	**Level 7 and above**	**Not Elsewhere Included**	**Total Defined**
Residents remaining from 2001	51615	26.8%	48.0%	9.8%	8.1%	7.3%	100.0%
Auckland	3669	18.9%	47.2%	11.2%	17.7%	5.0%	100.0%
Hamilton	1509	17.1%	46.9%	9.1%	22.5%	4.4%	100.0%
Overseas	5979	9.3%	51.4%	10.8%	23.1%	5.4%	100.0%

For each of the groups of migrants into the Tauranga area, the level of educational attainment is much higher than that for those who were resident in the area in 2001. Migration therefore potentially contributes to increasing the levels of educational attainment in the area, although the scale of this is dependent on the opportunities that are available. Finally given the strong perception that Tauranga is characterised as having large numbers of retirees with relatively low educational attainments an examination has been undertaken of the breakdown of educational attainment by age for all residents of Tauranga in 2006, all migrants and migrants from Auckland and the results are set out in Figure A1.4:

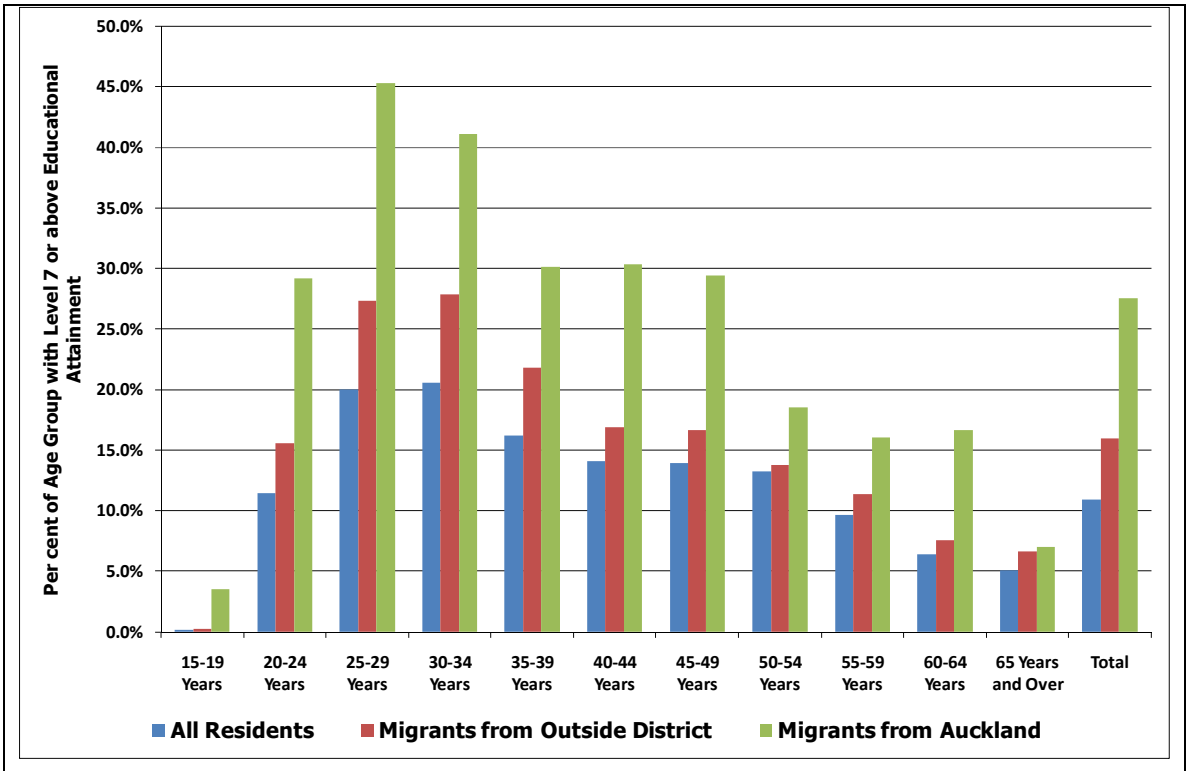


Figure A1.4
Educational Attainment by Age Group in Tauranga 2006

Migrants from Auckland to Tauranga have relatively high levels of educational attainment compared to both Tauranga residents and all migrants, although the level of attainment is low for the group over 65. This age group represents a relatively high share of the population Residents aged over 65 represent about 22 per cent of the total population over 15, although the share of this age group in migrants is smaller but still fairly large at about 15 per cent.

Appendix 2: Detailed reference tables and employment industry concentrations over time

This section contains the detailed tables that support the analysis of economic structure set out in Section 6 of the main report.

Table A2.1 Overview of the AHT and comparator economies, 2006 and 2009

	2006	2009	%pa growth 2006 to 2009
Employment (FTEs)			
Auckland Metropolis	555,281	568,776	0.8%
Wider Auckland	60,763	60,869	0.1%
Hamilton	67,740	69,606	0.9%
Tauranga	44,850	46,187	1.0%
Palmerston North	40,733	41,526	0.6%
Wellington	122,160	128,179	1.6%
New Plymouth	29,363	32,129	3.0%
Rotorua	28,160	27,456	-0.8%
Invercargill	21,837	23,607	2.6%
Dunedin	49,711	49,972	0.2%
Napier-Hastings	54,860	59,716	2.9%
Whangarei	29,617	31,194	1.7%
New Zealand	1,808,677	1,866,747	1.1%
Value added or GDP ($2009m)			
Auckland Metropolis	57,650	59,811	1.2%
Wider Auckland	5,707	5,531	-1.0%
Hamilton	6,526	6,719	1.0%
Tauranga	4,404	4,481	0.6%
Palmerston North	3,584	3,670	0.8%
Wellington	14,226	15,496	2.9%
New Plymouth	3,190	3,563	3.8%
Rotorua	2,617	2,667	0.6%
Invercargill	2,031	2,203	2.7%
Dunedin	4,446	4,450	0.0%
Napier-Hastings	4,996	5,339	2.2%
Whangarei	2,784	2,854	0.8%
New Zealand	178,702	185,554	1.3%
Productivity (GDP/FTEs)			
Auckland Metropolis	$103,821	$105,157	0.4%
Wider Auckland	$93,929	$90,868	-1.1%
Hamilton	$96,336	$96,529	0.1%
Tauranga	$98,185	$97,014	-0.4%
Palmerston North	$87,984	$88,384	0.2%
Wellington	$116,457	$120,895	1.3%
New Plymouth	$108,624	$110,899	0.7%
Rotorua	$92,938	$97,130	1.5%
Invercargill	$93,028	$93,336	0.1%
Dunedin	$89,441	$89,040	-0.1%
Napier-Hastings	$91,066	$89,401	-0.6%
Whangarei	$93,985	$91,476	-0.9%
New Zealand	$98,803	$99,400	0.2%

Source: BERL, Statistics NZ

Table A2.2 Population of the AHT and comparator economies 1996-2009

	Population				%pa growth	
	1996	2001	2006	2009	1996 to 2009	2006 to 2009
Auckland Metropolis	928,000	1,005,000	1,126,000	1,178,000	1.9	1.5
Wider Auckland	154,000	169,000	194,000	204,000	2.2	1.7
Hamilton	110,000	116,000	129,000	135,000	1.6	1.5
Tauranga	78,000	91,000	104,000	109,000	2.6	1.6
Palmerston North City	73,000	72,000	76,000	77,000	0.4	0.4
Wellington City	158,000	164,000	179,000	187,000	1.3	1.5
New Plymouth	68,000	67,000	69,000	70,000	0.2	0.5
Rotorua	65,000	64,000	66,000	66,000	0.1	0.0
Invercargill	53,000	50,000	50,000	51,000	-0.3	0.7
Dunedin	118,000	114,000	119,000	120,000	0.1	0.3
Napier/Hastings	120,000	121,000	126,000	128,000	0.5	0.5
Whangarei	67,000	68,000	74,000	77,000	1.1	1.3
New Zealand	3,618,000	3,737,000	4,028,000	4,155,000	1.1	1.0

Source: BERL, Statistics NZ

Table A2.3 Employment by industry in the AHT cities (FTEs and % of regional emp)

Industry group (FTEs, % of area's emp)	Auckland Metro		Wider Auckland		Hamilton		Tauranga		New Zealand	
Primary	3,213	1%	7,043	12%	944	1%	2,104	5%	153,603	8%
Primary processing	21,322	4%	2,768	5%	1,931	3%	1,631	4%	99,488	5%
Metal and machinery mfg	25,760	5%	4,011	7%	4,180	6%	1,890	4%	73,725	4%
All other manufacturing	24,076	4%	1,842	3%	2,093	3%	1,382	3%	56,695	3%
General construction	15,105	3%	3,990	7%	2,512	4%	2,216	5%	64,444	3%
Construction trades	22,382	4%	5,562	9%	3,394	5%	2,575	6%	84,322	5%
Wholesaling	56,606	10%	3,139	5%	4,868	7%	2,959	6%	122,702	7%
Retail and hospitality	83,038	15%	9,866	16%	11,132	16%	8,640	19%	288,045	15%
Surface transport	10,230	2%	1,703	3%	898	1%	1,225	3%	38,940	2%
Air transport	6,127	1%	101	0%	17	0%	68	0%	9,931	1%
Services to transport, storage	11,513	2%	880	1%	304	0%	923	2%	25,711	1%
Electricity, communications	12,654	2%	353	1%	1,735	2%	866	2%	33,642	2%
Finance and insurance	25,062	4%	993	2%	1,515	2%	1,082	2%	56,186	3%
Business services	112,444	20%	5,688	9%	11,061	16%	6,287	14%	267,383	14%
Arts, sport and recreation	36,670	6%	3,691	6%	4,204	6%	2,460	5%	118,633	6%
Government	17,340	3%	1,562	3%	3,276	5%	1,278	3%	74,235	4%
Education	39,937	7%	3,645	6%	5,413	8%	3,034	7%	129,445	7%
Health Services	32,450	6%	2,022	3%	7,841	11%	4,220	9%	117,601	6%
Community Services	12,845	2%	2,010	3%	2,289	3%	1,345	3%	52,017	3%
Total	**568,776**	**100%**	**60,869**	**100%**	**69,606**	**100%**	**46,187**	**100%**	**1,866,747**	**100%**

Source: BERL, Statistics NZ

Table A2.4 Employment by industry and region (FTEs, 2009)

Employment (FTEs, 2009)	Auckland Metropolis	Wider Auckland	Hamilton	Tauranga	Palmerston North	Wellington	Napier-Hastings	New Zealand	AHT (% of NZ)
Primary	3,213	7,043	944	2,104	888	470	9,928	153,603	8.7%
Primary processing	21,322	2,768	1,931	1,631	907	1,286	4,801	99,488	27.8%
Metal and machinery manufacturing	25,760	4,011	4,180	1,890	1,353	961	1,630	73,725	48.6%
All other manufacturing	24,076	1,842	2,093	1,382	1,203	1,843	1,264	56,695	51.8%
General construction	15,105	3,990	2,512	2,216	1,914	2,520	1,775	64,444	37.0%
Construction trades	22,382	5,562	3,394	2,575	1,871	3,054	2,680	84,322	40.2%
Wholesaling	56,606	3,139	4,868	2,959	3,013	4,788	2,887	122,702	55.1%
Retail and hospitality	83,038	9,866	11,132	8,640	6,690	15,101	8,883	288,045	39.1%
Surface transport	10,230	1,703	898	1,225	938	2,354	933	38,940	36.1%
Air transport	6,127	101	17	68	182	566	128	9,931	63.6%
Services to transport, storage	11,513	880	304	923	472	1,189	1,041	25,711	53.0%
Electricity, communications	12,654	353	1,735	866	452	4,828	663	33,642	46.4%
Finance and insurance	25,062	993	1,515	1,082	820	9,614	1,025	56,186	51.0%
Business services	112,444	5,688	11,061	6,287	4,723	29,070	6,624	267,383	50.7%
Arts, sport and recreation	36,670	3,691	4,204	2,460	3,056	11,565	3,659	118,633	39.6%
Government	17,340	1,562	3,276	1,278	3,886	21,139	1,472	74,235	31.6%
Education	39,937	3,645	5,413	3,034	3,535	8,033	4,313	129,445	40.2%
Health Services	32,450	2,022	7,841	4,220	3,907	7,246	3,627	117,601	39.6%
Community Services	12,845	2,010	2,289	1,345	1,717	2,550	2,384	52,017	35.5%
Sub-total	**568,776**	**60,869**	**69,606**	**46,187**	**41,526**	**128,179**	**59,716**	**1,866,747**	**39.9%**

source: BERL Regional Database, Statistics NZ

Table A2.5 Value added by industry and region (GDP 2009$m)

Value added (GDP $2009m)	Auckland Metropolis	Wider Auckland	Hamilton	Tauranga	Palmerston North	Wellington	Napier-Hastings	New Zealand	AHT (% of NZ)
Primary	250	591	69	125	66	406	671	13,149	7.9%
Primary processing	2,682	369	260	215	113	165	619	13,194	26.7%
Metal and machinery manufacturing	2,192	352	362	161	116	83	139	6,301	48.7%
All other manufacturing	2,523	203	229	144	123	180	122	5,959	52.0%
General construction	931	246	155	137	118	155	109	3,972	37.0%
Construction trades	1,157	288	175	133	97	158	139	4,359	40.2%
Wholesaling	6,509	354	553	332	346	547	327	13,983	55.4%
Retail and hospitality	4,098	499	554	438	335	707	441	14,144	39.5%
Surface transport	1,077	155	94	115	100	373	87	3,961	36.4%
Air transport	931	15	3	10	28	86	19	1,508	63.6%
Services to transport, storage	1,571	69	44	125	41	174	109	3,391	53.4%
Electricity, communications	5,660	165	779	406	202	2,248	306	15,195	46.1%
Finance and insurance	5,978	239	360	255	185	2,354	233	13,416	50.9%
Business services	15,256	1,191	1,518	1,089	725	3,596	1,113	40,983	46.5%
Arts, sport and recreation	2,164	200	206	129	140	584	169	6,304	42.8%
Government	2,071	195	428	161	431	2,685	186	9,158	31.2%
Education	1,923	188	268	146	156	372	203	6,127	41.2%
Health Services	2,451	153	592	319	295	547	274	8,881	39.6%
Community Services	387	61	69	41	52	77	72	1,567	35.5%
Sub-total	**59,811**	**5,531**	**6,719**	**4,481**	**3,670**	**15,496**	**5,339**	**185,554**	**41.3%**

Table A2.6 Concentration ratios by industry and region (2009)

Concentration ratios (2009)	Auckland Metropolis	Wider Auckland	Hamilton	Tauranga	Palmerston North	Wellington	Napier-Hastings	New Zealand	AHT (% of NZ)
Primary	0.07	1.41	0.16	0.55	0.26	0.04	2.02	1.00	0.22
Primary processing	0.70	0.85	0.52	0.66	0.41	0.19	1.51	1.00	0.70
Metal and machinery manufacturing	1.15	1.67	1.52	1.04	0.82	0.19	0.69	1.00	1.22
All other manufacturing	1.39	1.00	0.99	0.99	0.95	0.47	0.70	1.00	1.30
General construction	0.77	1.90	1.05	1.39	1.33	0.57	0.86	1.00	0.93
Construction trades	0.87	2.02	1.08	1.23	1.00	0.53	0.99	1.00	1.01
Wholesaling	1.51	0.78	1.06	0.97	1.10	0.57	0.74	1.00	1.38
Retail and hospitality	0.95	1.05	1.04	1.21	1.04	0.76	0.96	1.00	0.98
Surface transport	0.86	1.34	0.62	1.27	1.08	0.88	0.75	1.00	0.90
Air transport	2.03	0.31	0.04	0.28	0.83	0.83	0.40	1.00	1.59
Services to transport, storage	1.47	1.05	0.32	1.45	0.83	0.67	1.27	1.00	1.33
Electricity, communications	1.23	0.32	1.38	1.04	0.60	2.09	0.62	1.00	1.16
Finance and insurance	1.46	0.54	0.72	0.78	0.66	2.49	0.57	1.00	1.28
Business services	1.38	0.65	1.11	0.95	0.79	1.58	0.77	1.00	1.27
Arts, sport and recreation	1.01	0.95	0.95	0.84	1.16	1.42	0.96	1.00	0.99
Government	0.77	0.65	1.18	0.70	2.35	4.15	0.62	1.00	0.79
Education	1.01	0.86	1.12	0.95	1.23	0.90	1.04	1.00	1.01
Health Services	0.91	0.53	1.79	1.45	1.49	0.90	0.96	1.00	0.99
Community Services	0.81	1.19	1.18	1.05	1.48	0.71	1.43	1.00	0.89

source: BERL Regional Database, Statistics NZ

Employment concentration trends

Here we explore in more detail the changes in concentration coefficients across the time period from 1996 to 2009.[86] This is analysis will help to reveal whether the three cities are being successful in attracting knowledge intensive activities. As noted in Grimes et al (2010) the ability for cities to attract a disproportionate share of knowledge intensive activities is one of the key themes of modern spatial economics.[87]

Business services

Finance, as we have seen in the snapshot, is strongest in Wellington, with a concentration coefficient of 3.2. The coefficient in Auckland is 1.15, however, the coefficient has been increasing in Auckland since 1996, and has decreased in Wellington since 2001. The coefficients in Hamilton and Tauranga are 1.0 and 0.8 respectively. Hamilton's coefficient has been declining, but in recent times Tauranga's has been increasing. Interestingly, so has the coefficient for Whangarei. The Tauranga level of 0.8 is a similar order to those of most other provincial cities outside Wellington and Auckland.

The situation in the Insurance industry is very similar to that for finance, except that in the AHT, Hamilton's coefficient (1.36) is higher than Auckland's (1.2); whilst Tauranga has not increased its coefficient recently. The various components differ:

- In life insurance and general insurance the coefficient in Auckland has been increasing over time from between 1 and 1.3 in 1996 to between 1.6 and 1.7 in 2009.

[86] The concentration coefficient is the amount (in multiples) by which the share of employment in that industry in that region is greater than or less than the national average. Hence if the national average employment in Industry A is 4 per cent and the employment in Industry A in Region X is 8 per cent, the concentration coefficient for Industry A in Region X is 2.0.

[87] Grimes, A., Le Vaillant, J. and McCann, P. (2010), '*Auckland's Knowledge Economy: Australasian and European Comparisons.'* Prepared for the Ministry of Economic Development

- Over the same period the figures for life insurance have fallen from 04 to 0.2 or even lower in both Hamilton and Tauranga, and the general insurance figure has fallen from above 1 to the range 0.5 to 0.7 in Hamilton and Tauranga.
- Hamilton has a high coefficient (over 4.0 throughout the period) for the Health insurance industry.

This implies that more of the core employment in these industries is gravitating to Auckland, with Hamilton and Tauranga most likely obtaining increasing proportions of service from there. This appears to be borne out by a strong increase in the figure for the 'Services to Insurance' industry in Tauranga, and to a lesser extent in Hamilton.

Property services are relatively stronger in Auckland and Tauranga and other Business services are stronger in Auckland and Hamilton, showing that there tends to be some complementarily among the three cities when it comes to these services.

Tauranga is notably high in Architectural services as is Auckland. This strength in Tauranga is reflected in the manufacturing sector, which is discussed below. A good reason for this strength is the boom in construction activity required to support population growth. This reflects what is probably Tauranga's greatest economic asset – it's location and high natural amenity.

All three cities are strong in surveying and consulting engineering services reflecting their recent growth and also to some extent demonstrating the localised nature of aspects of these activities.

In some of the core business services like legal and accounting, the concentration coefficients in Hamilton and Tauranga are around 1, as they are in most cities. This implies that there is not a great amount of diversion of these tasks to Auckland. However the coefficients for Auckland and Wellington are higher than for other cities. One interesting response we elicited from an interviewee was that following the relocation of the firm's business service activities from Auckland to Tauranga, the firm in question then worked with a local legal services provider to train staff to deal with their specific legal needs, rather than continuing to use the previous legal services provider in Auckland. Specialist legal issues were dealt with by a Wellington provider. This reflected the more general response elicited from Tauranga interviewees and noted elsewhere that there was a strong preference for sourcing inputs from local providers where possible.

Cultural Services

The snapshot indicated that perhaps the overall group of culture, sport and recreation had some dependence of Hamilton and Tauranga on Auckland for these services overall. Looking first at Motion Pictures, Radio and Television, Auckland is strong at 1.67, Hamilton 0.8 and Tauranga is low at 0.4. This contrasts with most other cities (except for Wellington and Dunedin) having coefficients of about 0.5 to 0.8. Interestingly, Whangarei seems to feel the same effect, as it has a coefficient of 0.4. Both Tauranga and Whangarei have increased their coefficient over the period 1996 to 2009.

The pattern is similar for Libraries, Museums and the Arts. Auckland has 1.2, Hamilton 0.7 and Tauranga 0.5. A number of other cities have coefficients over 1.0, and

Whangarei has a coefficient of just 0.4. The sorts of industries that pull down the figures for Hamilton and Tauranga are the Creative Arts, sound recording studios, general services to the arts, and the like.

Hamilton, Tauranga and Whangarei are all increasing their coefficients quite strongly in employment in recreational parks and gardens, and musical and theatre productions. Auckland is increasing a little also in the later periods, perhaps indicating some synergy among these cities.

The Sport and Recreation industry coefficient in Hamilton at 1.15, is significantly higher than in Auckland (0.8) or Tauranga (0.9). This is driven mostly by the sports grounds and facilities (other than horse and dog racing) which may reflect motor racing and other activities. The Tauranga figure has started increasing recently. The Whangarei figure is 1.2, similar to Hamilton. There is no particular pattern apparent among the three AHT cities, or among the cities overall.

This finding reflects the conclusions reached by Meijers (2008) who found that metropolitan size (using population) in cities in the Netherland reflected the relative presence of cultural, leisure and sports amenities.[88]

Personal and private services

The Personal and Other Private services industries are substantial and diversified. Personal services are largely concentrated in the cities, and all cities across the country have concentration coefficients of about 1.0 to 1.2 in this industry. In the AHT triangle, Auckland has 1.12, Hamilton 1.23 and Tauranga 1.27. It is notable that in a number of the industry groups, Hamilton scores higher than other cities in the "Not Elsewhere Classified' categories, as for example 'Personal Services nec'. This could imply that Hamilton is large enough to have a broader range of services than the smaller cities of about 70,000 to 80,000.

Social Services

In education, Auckland began the study period quite low with a coefficient of only 0.9, whereas Hamilton was relatively high with a coefficient of1.4. However from 1996 to 2009 the Auckland coefficient has been increasing, while the Hamilton one has decreased. Tauranga began slightly below Auckland at 0.8, and since then has been increasing too. This pattern has been reflected in the relative relationship between Wellington and Palmerston North, where Wellington began low, at 0.9 and has increased, whilst Palmerston North began high at 1.9 and has decreased.

The general picture is that across most cities the coefficients for Preschool, Primary and Secondary education are close to 1, as would be expected. There is little regional specialisation in these areas and services are delivered in the community. Special School Education is unusual in that Auckland coefficient has fallen from 2.9 in 1996 to 1.3 in 2009, whereas Hamilton has increased from 0.2 to 1.5 and Tauranga has

[88] Meijers, E.J. (2008) 'Summing small cities does not make a large city: Polycentric Urban Regions and the provision of Cultural, Leisure and Sports Amenities', Urban Studies, 45, pp. 2323-2342.

increased from 0.4 to 0.9 in the same period. We have no information as to why this would be so.

It is in Higher Education and Technical and Further Education that the differences emerge, with increasing specialisation and concentration of activity in fewer but larger facilities. Auckland has coefficients of about 1.0 to 1.2 in these two over the period. Hamilton on the other hand had a coefficient of 2.9 in Higher Education, though that declined to1.5 by 2009. In Technical and Further Education Hamilton has had a coefficient above 2.0 for the whole period. The important contrast is that Tauranga has had a coefficient of only 0.5 for Higher Education, and little above zero for Technical and Further Education. This observation is also reflected in an acute awareness amongst our interviewees that Tauranga, as noted earlier, is lacking in the provision tertiary education opportunities.

With Health services Hamilton has a high concentration coefficient of 1.8, and Tauranga is also high, at 1.28. These are boosted mainly by high coefficients for Specialist Medical Services, around 2.0, which reflects their role within the settlement hierarchies in their regions.

Auckland on the other hand is 0.9, which perhaps is surprising given Auckland's acknowledged role in specialist services for the country as a whole. Most of the cities have coefficients above 1.0, as the more complex health services are located in cities.

Goods-Producing and handling industries

The primary processing industries are some of the most important in New Zealand. Many of the big primary processing plants where initial transformation of base raw produce takes place (e.g. dairy factories) are located outside of cities, and so city coefficients tend to be low. For food, beverages and tobacco, Auckland, Hamilton and Tauranga are 0.6 to 0.8. For textiles, clothing and footwear Auckland is high (1.3), and the other two low at .8 and .6. Wood and paper are a little below 1 in all three cities. It is the more complex transformation of primary produce that takes place in urban areas, notably Auckland. However, there is little evidence of significant flows of input materials from Hamilton and Tauranga into Auckland for further processing.

The most significant industry in the manufacturing group is the Metal product manufacturing one. Here Hamilton is very strong at 1.7 and increasing. The main strength is in Steel Pipe and Tube manufacturing with coefficients over 7.0, Aluminium Rolling, Drawing and Extruding, and Metal Container Manufacturing. This reflects the development of expertise in metals manufacturing needed to support the dairy industry, for example, stainless steel products and the successful generalisation of these skills into other sectors. This is consistent with Hamilton's current economic position, as a rural service centre that has successfully diversified it's manufacturing base into new, non-agricultural sectors. Hamilton is home to large number of diverse firms operating in these sectors, from small, specialist operators to larger national and international organisations. Some specialise in a specific metal (e.g. stainless steel or aluminium) whilst some have generalised outside of supporting agriculture (e.g. broadening into security systems, marine products or general metal products).

Tauranga has a coefficient of about 1 for each industry, and here the strength of Metal Product manufacturing reflects the relatively high degree of activity in Architectural

Aluminium Product manufacturing and Structural Steel Fabricating. It would seem that the manufacture of architectural products is associated with a higher level of architectural activity. On the other hand, Auckland is strongest in the lighter end of the Metal Product spectrum, namely Nut, Bolt, Screw and Rivet making, Spring and Wire products, and Metal Coating and Finishing.

Again, reflecting its central position as a service centre for the dairy sector in the Waikato, Hamilton is also strong in machinery and equipment manufacturing, at 1.08 and increasing. This strength is associated with the steel and aluminium industries above in the whole area of food processing, stainless fabrication etc. Consequently Hamilton is strong in Professional and Scientific Equipment manufacture, Computer and Business machine (e.g. robotics) manufacture, Machine Tools and Parts, and also agricultural, mining and construction machinery manufacture.

Tauranga has strength in Boatbuilding and in Agricultural Machinery manufacture. It has recently expanded in manufacture of Lifting and Material Handling Equipment, and Pumps and Compressors. There appears to have been some reduction in the coefficients of these in Auckland over the period, which may reflect some re-location of this type of industry towards Tauranga.

Auckland is moderately strong in both of the Metal and Machinery industries also with coefficients about 1.3, though they are both decreasing in importance over time

The construction industry has been strong in Tauranga, but its importance is now declining as population growth moderates. The Auckland coefficient is about 0.9 for the industry and its services, which may indicate that some of the construction in Auckland is done with capacity from Hamilton and Tauranga, as part of the complementary relationship.

Wholesaling is broken down into that for basic materials; for machinery and motor vehicles; and for personal and household goods. Auckland has high coefficients for the latter two (1.6 and 1.9 respectively) and a solid coefficient of 1.14 for the basic materials Hamilton is quite strong in machinery and vehicles, while Tauranga is strong in basic materials, with a coefficient of 1.66. This pattern reflects the production pattern and trade pattern in the respective regions.

Reference tables for Auckland Metro

Table A2.7 Employment across time by industry (FTEs), Auckland Metro

Employment in the Auckland Metro	% of area's total				%pa change		
	1996	2001	2006	2009	1996-2001	2001-2006	2006-2009
Primary	1.0%	0.8%	0.6%	0.6%	-2.7	-1.6	-2.9
Primary processing	6.5%	4.8%	4.0%	3.7%	-4.3	0.3	-1.5
Metal and machinery manufacturing	6.6%	5.6%	4.9%	4.5%	-1.9	1.5	-1.9
All other manufacturing	7.1%	5.8%	5.2%	4.2%	-2.6	1.9	-6.0
General construction	2.4%	2.5%	2.7%	2.7%	2.0	5.8	0.4
Construction trades	3.7%	4.1%	4.3%	3.9%	3.5	5.0	-2.1
Wholesaling	10.9%	10.8%	10.4%	10.0%	1.3	3.3	-0.7
Retail and hospitality	15.6%	15.3%	15.0%	14.6%	1.3	3.5	0.0
Surface transport	2.1%	2.0%	1.8%	1.8%	0.4	2.4	0.1
Air transport	1.3%	1.1%	1.1%	1.1%	-2.6	4.1	1.4
Services to transport, storage	2.0%	2.1%	2.0%	2.0%	1.9	3.1	1.5
Electricity, communications	2.6%	2.7%	2.5%	2.2%	2.4	2.7	-3.1
Finance and insurance	4.1%	3.9%	4.2%	4.4%	0.8	5.5	2.4
Business services	13.5%	17.1%	19.1%	19.8%	6.4	6.4	2.0
Arts, sport and recreation	5.4%	5.8%	6.2%	6.4%	3.3	5.5	1.9
Government	3.3%	2.5%	2.5%	3.0%	-3.9	3.9	7.3
Education	6.2%	5.9%	6.3%	7.0%	0.7	5.1	4.7
Health Services	4.7%	5.4%	5.3%	5.7%	4.4	3.5	3.3
Community Services	0.9%	1.9%	1.8%	2.3%	19.9	2.9	7.9
Sub-total	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**1.6**	**4.0**	**0.8**

source: BERL Regional Database, Statistics NZ

Table A2.8 Value added across time by industry (GDP 2009$m), Auckland Metro

Value added in the Auckland Metro (GDP $2009m)	% of area's total				%pa change		
	1996	2001	2006	2009	1996-2001	2001-2006	2006-2009
Primary	0.8%	0.6%	0.5%	0.4%	-1.9	0.1	-5.4
Primary processing	6.2%	4.8%	4.6%	4.5%	-1.1	3.6	0.3
Metal and machinery manufacturing	5.3%	4.8%	4.3%	3.7%	1.9	2.0	-4.0
All other manufacturing	7.1%	5.8%	4.9%	4.2%	-0.2	0.9	-3.4
General construction	1.5%	1.6%	1.7%	1.6%	4.3	6.7	-2.6
Construction trades	2.2%	2.1%	2.3%	1.9%	3.1	6.5	-4.1
Wholesaling	12.6%	13.0%	11.6%	10.9%	4.6	2.2	-1.0
Retail and hospitality	7.2%	6.7%	7.0%	6.9%	2.4	5.5	0.4
Surface transport	1.8%	1.8%	1.8%	1.8%	3.9	4.2	2.0
Air transport	1.7%	1.7%	1.6%	1.6%	2.9	4.1	-0.1
Services to transport, storage	3.0%	2.7%	2.6%	2.6%	2.2	3.6	1.1
Electricity, communications	5.6%	7.8%	9.4%	9.5%	11.1	8.5	1.5
Finance and insurance	6.2%	7.8%	8.8%	10.0%	8.9	6.9	5.7
Business services	24.9%	24.5%	24.7%	25.5%	3.5	4.7	2.3
Arts, sport and recreation	3.1%	3.4%	3.4%	3.6%	6.2	4.2	3.4
Government	3.2%	2.8%	2.8%	3.5%	0.9	4.8	8.1
Education	3.4%	3.4%	3.5%	3.2%	3.4	5.2	-1.3
Health Services	3.5%	4.0%	3.8%	4.1%	6.9	3.8	3.4
Community Services	0.6%	0.6%	0.6%	0.6%	5.4	2.4	5.2
Sub-total	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**3.9**	**4.5**	**1.2**

source: BERL Regional Database, Statistics NZ

Table A2.9 Concentration ratios across time by industry, Auckland Metro

Concentration ratios in the Auckland Metro	1996	2001	2006	2009	%pa change 1996-2001	2001-2006	2006-2009
Primary	0.10	0.08	0.08	0.07	-2.8	-2.2	-3.2
Primary processing	0.82	0.70	0.67	0.70	-3.2	-0.9	1.6
Metal and machinery manufacturing	1.30	1.23	1.16	1.15	-1.1	-1.2	-0.3
All other manufacturing	1.56	1.48	1.41	1.39	-1.1	-0.9	-0.5
General construction	0.83	0.85	0.77	0.77	0.5	-1.9	0.1
Construction trades	1.05	1.01	0.91	0.87	-0.7	-2.1	-1.4
Wholesaling	1.61	1.62	1.53	1.51	0.0	-1.1	-0.3
Retail and hospitality	0.98	0.95	0.94	0.95	-0.7	-0.2	0.2
Surface transport	0.88	0.87	0.86	0.86	-0.4	-0.1	0.1
Air transport	2.09	2.11	2.08	2.03	0.2	-0.2	-1.0
Services to transport, storage	1.59	1.53	1.46	1.47	-0.8	-0.9	0.2
Electricity, communications	1.08	1.21	1.31	1.23	2.2	1.7	-2.1
Finance and insurance	1.21	1.41	1.44	1.46	3.1	0.5	0.5
Business services	1.34	1.39	1.38	1.38	0.7	-0.1	0.1
Arts, sport and recreation	1.07	1.04	1.01	1.01	-0.6	-0.4	0.0
Government	0.75	0.75	0.72	0.77	-0.1	-0.9	2.3
Education	0.88	0.90	1.01	1.01	0.4	2.2	0.2
Health Services	0.91	0.93	0.91	0.91	0.6	-0.5	-0.2
Community Services	0.88	0.85	0.77	0.81	-0.8	-1.8	1.6

source: BERL Regional Database, Statistics NZ

Reference tables for Hamilton

Table A2.10 Employment across time by industry (FTEs) Hamilton

Employment in the Hamilton	% of area's total 1996	2001	2006	2009	%pa change 1996-2001	2001-2006	2006-2009
Primary	2.3%	2.0%	1.6%	1.4%	-1.6	1.1	-5.3
Primary processing	5.7%	4.2%	3.8%	2.8%	-5.4	3.5	-9.0
Metal and machinery manufacturing	6.8%	6.9%	6.1%	6.0%	1.2	3.1	0.2
All other manufacturing	4.0%	3.7%	3.8%	3.0%	-0.3	5.5	-6.4
General construction	3.1%	3.4%	4.1%	3.6%	2.3	9.9	-3.4
Construction trades	3.7%	4.6%	5.5%	4.9%	5.5	9.1	-2.9
Wholesaling	6.8%	6.6%	7.5%	7.0%	0.3	8.0	-1.3
Retail and hospitality	16.8%	16.9%	15.6%	16.0%	1.1	3.7	1.8
Surface transport	1.9%	1.5%	1.0%	1.3%	-4.2	-2.1	9.8
Air transport	0.1%	0.0%	0.0%	0.0%	-13.5	-10.8	11.8
Services to transport, storage	0.6%	0.6%	0.4%	0.4%	2.2	-0.4	0.0
Electricity, communications	3.6%	3.5%	2.5%	2.5%	0.5	-1.3	0.7
Finance and insurance	3.7%	2.6%	2.4%	2.2%	-6.1	4.1	-2.8
Business services	11.5%	12.2%	16.3%	15.9%	2.1	11.6	0.1
Arts, sport and recreation	5.0%	5.4%	5.7%	6.0%	2.8	6.5	2.8
Government	4.3%	4.0%	3.0%	4.7%	-0.5	-0.4	17.0
Education	9.9%	8.9%	7.2%	7.8%	-1.1	1.1	3.4
Health Services	9.5%	10.6%	10.5%	11.3%	3.2	5.1	3.3
Community Services	0.7%	2.3%	2.9%	3.3%	26.3	10.7	5.6
Sub-total	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**0.9**	**5.4**	**0.9**

source: BERL Regional Database, Statistics NZ

Table A2.11 Value added across time by industry (GDP 2009$m), Hamilton

Value added in the Hamilton	% of area's total				%pa change		
(GDP $2009m)	1996	2001	2006	2009	1996-2001	2001-2006	2006-2009
Primary	1.4%	1.3%	1.3%	1.0%	1.0	5.4	-6.6
Primary processing	6.0%	4.8%	5.2%	3.9%	-1.6	6.9	-8.2
Metal and machinery manufacturing	5.8%	6.4%	5.9%	5.4%	5.2	3.6	-2.2
All other manufacturing	4.4%	4.1%	3.9%	3.4%	1.8	4.2	-3.6
General construction	2.1%	2.2%	2.9%	2.3%	4.6	10.8	-6.3
Construction trades	2.2%	2.4%	3.1%	2.6%	5.1	10.7	-4.9
Wholesaling	8.1%	8.4%	8.9%	8.2%	3.7	6.6	-1.8
Retail and hospitality	8.0%	7.7%	8.0%	8.3%	2.5	5.8	2.1
Surface transport	1.9%	1.4%	1.2%	1.4%	-3.2	1.7	6.5
Air transport	0.1%	0.1%	0.0%	0.0%	-8.7	-10.8	10.1
Services to transport, storage	0.8%	0.8%	0.7%	0.7%	1.1	2.5	-0.1
Electricity, communications	8.8%	12.5%	10.4%	11.6%	10.7	1.3	4.7
Finance and insurance	5.9%	5.3%	5.4%	5.4%	1.3	5.3	0.8
Business services	23.2%	20.4%	22.7%	22.6%	0.5	7.5	0.8
Arts, sport and recreation	2.8%	3.1%	2.9%	3.1%	4.7	4.0	2.9
Government	5.2%	5.2%	4.1%	6.4%	2.9	0.2	17.4
Education	5.6%	5.1%	4.2%	4.0%	1.3	1.3	-0.8
Health Services	7.2%	8.1%	8.2%	8.8%	5.7	5.4	3.4
Community Services	0.5%	0.8%	1.0%	1.0%	11.0	10.2	3.0
Sub-total	100.0%	100.0%	100.0%	100.0%	3.1	5.2	1.0

source: BERL Regional Database, Statistics NZ

Table A2.12 Concentration ratios across time by industry, Hamilton

					%pa change		
Concentration ratios in the Hamilton	1996	2001	2006	2009	1996-2001	2001-2006	2006-2009
Primary	0.22	0.21	0.20	0.16	-1.1	-0.9	-5.8
Primary processing	0.73	0.61	0.63	0.52	-3.6	0.9	-6.2
Metal and machinery manufacturing	1.32	1.52	1.44	1.52	2.8	-1.0	1.7
All other manufacturing	0.87	0.96	1.02	0.99	1.9	1.2	-0.9
General construction	1.07	1.15	1.17	1.05	1.4	0.4	-3.8
Construction trades	1.04	1.14	1.16	1.08	1.9	0.3	-2.3
Wholesaling	1.01	1.00	1.10	1.06	-0.3	2.0	-1.1
Retail and hospitality	1.06	1.05	0.98	1.04	-0.2	-1.3	1.9
Surface transport	0.79	0.63	0.47	0.62	-4.4	-5.8	9.7
Air transport	0.14	0.08	0.03	0.04	-10.6	-15.7	9.1
Services to transport, storage	0.44	0.44	0.33	0.32	0.1	-5.5	-1.4
Electricity, communications	1.51	1.58	1.31	1.38	0.9	-3.6	1.7
Finance and insurance	1.10	0.94	0.84	0.72	-3.3	-2.2	-4.7
Business services	1.14	0.99	1.17	1.11	-2.8	3.4	-1.8
Arts, sport and recreation	0.99	0.97	0.93	0.95	-0.5	-0.9	0.7
Government	0.97	1.18	0.85	1.18	4.0	-6.3	11.4
Education	1.41	1.36	1.16	1.12	-0.7	-3.1	-1.2
Health Services	1.83	1.83	1.80	1.79	0.1	-0.3	-0.3
Community Services	0.76	0.98	1.20	1.18	5.2	4.3	-0.7

source: BERL Regional Database, Statistics NZ

Reference tables for Tauranga

Table A2.13 Employment across time by industry (FTEs) Tauranga

	% of area's total				%pa change		
Employment in the Tauranga	1996	2001	2006	2009	1996-2001	2001-2006	2006-2009
Primary	4.6%	5.4%	4.1%	4.6%	6.4	-0.1	4.3
Primary processing	6.2%	5.9%	4.9%	3.5%	2.1	1.6	-9.6
Metal and machinery manufacturing	5.1%	4.8%	4.5%	4.1%	2.2	3.9	-2.3
All other manufacturing	5.1%	4.4%	3.6%	3.0%	-0.1	1.5	-5.3
General construction	5.0%	4.8%	5.8%	4.8%	2.3	9.1	-5.0
Construction trades	5.2%	5.9%	6.6%	5.6%	5.7	7.5	-4.3
Wholesaling	6.9%	6.5%	6.8%	6.4%	2.1	6.1	-0.8
Retail and hospitality	19.3%	19.1%	19.0%	18.7%	2.9	5.3	0.4
Surface transport	3.0%	2.7%	2.6%	2.7%	1.0	4.9	1.0
Air transport	0.1%	0.2%	0.2%	0.1%	12.9	7.3	-4.9
Services to transport, storage	2.8%	2.7%	2.3%	2.0%	2.6	2.0	-3.9
Electricity, communications	2.6%	2.4%	2.5%	1.9%	1.7	5.6	-7.6
Finance and insurance	2.6%	2.1%	2.0%	2.3%	-0.6	4.2	6.1
Business services	9.8%	11.5%	12.1%	13.6%	6.6	6.5	5.0
Arts, sport and recreation	4.7%	4.9%	5.0%	5.3%	4.1	5.8	3.0
Government	3.1%	2.0%	2.4%	2.8%	-5.3	9.6	5.2
Education	5.6%	5.6%	5.2%	6.6%	3.4	3.8	9.0
Health Services	6.7%	5.5%	7.4%	9.1%	-0.7	11.8	8.2
Community Services	1.7%	3.3%	2.8%	2.9%	17.3	2.2	1.9
Sub-total	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**3.1**	**5.4**	**1.0**

source: BERL Regional Database, Statistics NZ

Table A2.14 Value added across time by industry (GDP 2009$m), Tauranga

Value added in the Tauranga	% of area's total				%pa change		
(GDP $2009m)	1996	2001	2006	2009	1996-2001	2001-2006	2006-2009
Primary	3.5%	4.0%	3.1%	2.8%	7.5	0.3	-2.5
Primary processing	6.9%	6.9%	6.4%	4.8%	5.0	4.2	-8.7
Metal and machinery manufacturing	4.2%	4.4%	4.2%	3.6%	6.0	4.8	-4.3
All other manufacturing	5.2%	4.5%	3.6%	3.2%	2.3	0.7	-2.7
General construction	3.3%	3.2%	4.0%	3.0%	4.6	10.1	-7.9
Construction trades	3.1%	3.1%	3.7%	3.0%	5.3	9.1	-6.3
Wholesaling	8.1%	8.3%	7.9%	7.4%	5.7	4.5	-1.5
Retail and hospitality	9.2%	8.8%	9.6%	9.8%	4.2	7.5	1.2
Surface transport	2.6%	2.4%	2.6%	2.6%	3.8	6.7	0.8
Air transport	0.1%	0.3%	0.3%	0.2%	19.2	7.3	-6.3
Services to transport, storage	4.2%	3.7%	3.1%	2.8%	2.6	2.3	-3.2
Electricity, communications	6.8%	9.6%	10.6%	9.1%	12.5	7.9	-4.6
Finance and insurance	4.1%	4.2%	4.1%	5.7%	5.3	5.0	12.6
Business services	22.8%	22.4%	21.6%	24.3%	4.7	4.9	4.7
Arts, sport and recreation	2.4%	2.8%	2.5%	2.9%	8.4	3.5	4.9
Government	3.7%	2.6%	3.1%	3.6%	-2.2	9.9	5.0
Education	3.4%	3.5%	3.1%	3.3%	5.8	3.4	2.1
Health Services	5.0%	4.3%	5.7%	7.1%	1.7	12.0	8.3
Community Services	1.2%	1.1%	0.9%	0.9%	3.1	1.8	-0.6
Sub-total	100.0%	100.0%	100.0%	100.0%	5.1	5.7	0.6

source: BERL Regional Database, Statistics NZ

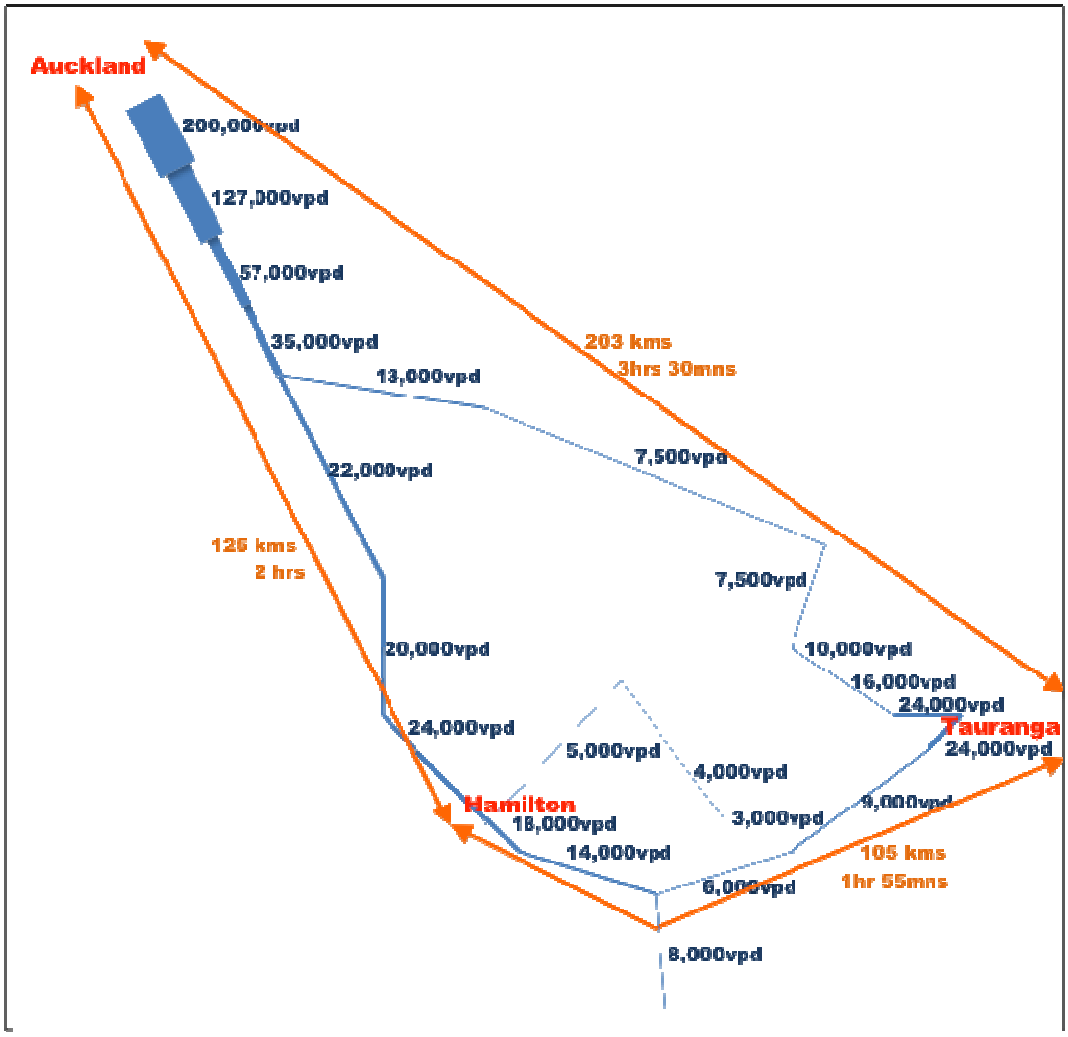
Table A2.15 Concentration ratios across time by industry, Tauranga

					%pa change		
Concentration ratios in the Tauranga	1996	2001	2006	2009	1996-2001	2001-2006	2006-2009
Primary	0.44	0.55	0.50	0.55	4.7	-2.0	3.8
Primary processing	0.79	0.86	0.82	0.66	1.8	-1.0	-6.9
Metal and machinery manufacturing	0.99	1.07	1.06	1.04	1.6	-0.1	-0.8
All other manufacturing	1.12	1.12	0.98	0.99	0.0	-2.6	0.1
General construction	1.72	1.66	1.64	1.39	-0.7	-0.2	-5.5
Construction trades	1.47	1.47	1.39	1.23	-0.1	-1.1	-3.8
Wholesaling	1.01	0.98	0.99	0.97	-0.6	0.2	-0.7
Retail and hospitality	1.21	1.18	1.20	1.21	-0.5	0.2	0.4
Surface transport	1.26	1.18	1.24	1.27	-1.3	1.0	0.8
Air transport	0.17	0.32	0.35	0.28	14.3	1.5	-7.2
Services to transport, storage	2.18	2.01	1.71	1.45	-1.6	-3.2	-5.3
Electricity, communications	1.10	1.10	1.29	1.04	0.0	3.3	-6.8
Finance and insurance	0.77	0.77	0.70	0.78	0.2	-2.1	3.8
Business services	0.97	0.94	0.87	0.95	-0.6	-1.4	2.9
Arts, sport and recreation	0.94	0.88	0.82	0.84	-1.3	-1.4	0.8
Government	0.70	0.60	0.69	0.70	-3.1	3.1	0.1
Education	0.79	0.85	0.84	0.95	1.5	-0.3	4.1
Health Services	1.28	0.95	1.28	1.45	-5.8	6.0	4.4
Community Services	1.80	1.44	1.19	1.05	-4.4	-3.7	-4.2

source: BERL Regional Database, Statistics NZ

Appendix 3: Traffic Volumes in the AHT Region

Map A3.1 Traffic volumes (vehicles per day) on key road links within the AHT region.



Source: NZTA (traffic volumes)

Appendix 4: Firm and Stakeholder Interviews

Understanding the linkages which exist within the service sector is a core component of our analysis. In a recent paper examining the results of 34 different studies of agglomeration effects Melo et al (2009) pointed out that "while historically agglomeration of manufacturing was of interest, the larger potential benefits of service sector agglomeration deserve further study."[89] The authors found that service industries tend to derive considerably larger benefits from urban agglomeration and estimated that the elasticity of urban agglomeration for service industries is about 8 percent higher than the elasticity estimates for the aggregate economy in the United States.

However, understanding these linkages also poses a challenge due to a conspicuous lack of data, compared to more tangible economic activity such as freight movements. As the Peer Review report[90] noted, the data on service linkages and movements is particularly scant.

As a way of validating the available data and adding to our understanding of service activities in the region we undertook 21 face-to-face interviews with a number firms in key sectors or with appropriate public sector organisation. We have used these interviews to provide additional primary information around factors including:

- functional operation of firms (regionally and locally);
- linkages between suppliers and customers, both between and within firms) in the AHT region; and
- location decisions of firms.

The results of the interviews are not intended to be used for statistical purposes as the sample size is too small to draw any detailed statistical results from. However, the information is a useful, descriptive supplement to the data analysis and provides some revealing insights into the ways in which service activities are undertaken on a region wide basis.

Generally we have reported these findings as individual examples but have also looked for interesting and relevant patterns and trends in the responses to add to our analysis.

[89] Melo, P.C., Graham, D. J. and Noland, R.B., 2009, *A meta-analysis of estimates of urban agglomeration economies.* Regional Science and Urban Economics 39 (2009) 332–342. p341.
[90] Infometrics, 2010, Peer Review of economic Linkage Between New Zealand Cities: Methodology Report.

Table A4.1: List of Interviewees

Organisation	Location
Traffic Design Group	Auckland
Opportunity Hamilton (Hamilton EDA)	Hamilton
Innovation Waikato	Hamilton
Enterprising Manukau	Auckland
Waikato-Tainui Te Kauhanganui Inc	Hamilton
Intercity Coachlines	Auckland
Priority One (Tauranga EDA)	Tauranga
Stainless Down Under	Tauranga (Katikati)
Ports of Auckland Ltd	Auckland
WINTEC	Hamilton
University of Waikato	Hamilton
Waikato District Health Board	Hamilton
Hamilton City Council	Hamilton
Port of Tauranga	Tauranga
Zespri	Tauranga
KPMG	Tauranga
Courier Post	Auckland
Linfox	Hamilton
AREDA	Auckland
Auckland International Airport Ltd	Auckland
Westpac	Hamilton
Ag Research	Hamilton

Appendix 5: Development of a Regional Agglomeration Model

Agglomeration benefits measure the impacts that arise when economic activities become more closely clustered and the level of interaction between these increases. This improved interaction results in a number of benefits which can improve economic productivity. These include:

- Sharing of indivisible facilities or benefitting from economies of scale in production;
- Matching the skills required by businesses with an expanded availability of labour;
- Improving interactions in the value chain by allowing firms to integrate more effectively with their customers and suppliers; and
- Improvements in the generation, diffusion and accumulation of knowledge.

The ease of interaction can be changed either by the physical relocation of activities or alternatively by other changes in the costs of the links between them and in particular by altering the journeys times along these.

NZTA have undertaken considerable work on the assessment of these potential benefits which come under the category of Strategic Benefits in the Economic Evaluation Manual. They have undertaken research looking at the position within New Zealand for a range of activities and have developed parameters which measure the effects of changes. While it is probably reasonable to say that this approach is still evolving and may not fully take into account the strength of the factors affecting productivity within Auckland (as for example described in earlier work by the consultants) it does represent a base position for considering agglomeration impacts at a regional level. The approach developed by NZTA and the agglomeration elasticities estimated have therefore been used in the appraisal for this work.

It should also be noted that in principle agglomeration benefits only form part of the wider economic benefits resulting from major transport schemes, and the approaches developed only reflect changes in productivity of the labour force rather than changes in the locational pattern of employment. In addition, as measured using the NZTA approach they relate only to interactions between workers at their place of work and do not take into account the benefits of improved matching of the skills of the workforce resident in an area with opportunities elsewhere. However, agglomeration benefits as defined here have proved amenable to investigation in some detail and sufficient confidence in their estimation has been derived to allow this process to be included in standard transport evaluation methodologies in New Zealand and the UK. In New Zealand, agglomeration benefits have been determined for a number of schemes including the Waterview Connection, the central component of the Waikato Expressway round Hamilton, the Tauranga Eastern Link, the urban components of the Wellington Urban RoNS, Christchurch Motorways RoNS and the Rail Development Plan in Auckland.

Although in general agglomeration benefits have been considered within the context of single urban areas, work undertaken for the Northern Way in the UK used a similar approach to look at agglomeration benefits as links between free-standing towns and cities were improved. The analysis developed to estimate agglomeration elasticities in

New Zealand was also based on a nationwide assessment of impacts. While the development of a regional agglomeration model is innovative, the approach underlying this is soundly based.

Approach to the Assessment of Agglomeration Impacts

The approach developed by NZTA works on the principle that a key driver of the level of productivity or agglomeration benefit is the "effective density" of a particular location. For these purposes, effective density is a measure of accessibility and is represented by a function combining the number of jobs at different locations within the study area and a measure of their separation (distance or time or a combination of the two) from the zone. Reflecting this, jobs with a greater measure of separation from the area in question have a lower impact on agglomeration effects than those closer as workers are less able to interact easily. The relationships developed by NZTA measure separation based on generalised costs which combine the time and distance elements of travel. These have been based on standard values of time and distance as derived from the NZTA manual. A job with a generalised cost of 10 from the target zone would make a contribution of 0.1 to the effective density and one with a generalised cost of 50 a contribution of 0.02

Using these relationships, it is possible to build up the effective densities for each centre and importantly for this study indicate the contributions of different areas to this effective density. It is therefore possible to estimate the importance of Hamilton and Tauranga to economic activity in Auckland and of Auckland to economic activity in Hamilton and Tauranga as well as estimating the impacts of changes in the transport network which affect the measure of separation on levels of economic productivity.

Based on typical journey times and distances between the various centres (derived from the data in Google Maps) the effective densities that result for each of the major centres in 2006 are set out Table A5.1:

Table A5.1
Effective Densities and Contributions from Auckland Hamilton and Tauranga 2006 Employment Levels

Area	Effective Density (Weighted accessibility of employment accessible to area)	Contribution to Effective Density from		
		Auckland Metro Area	Hamilton	Tauranga
Whangarei	8733	42%	3%	2%
Rodney	16852	61%	2%	1%
North Shore	33950	88%	1%	1%
Auckland	51722	92%	1%	1%
Waitakere	30322	88%	2%	1%
Manukau	34428	86%	2%	1%
Papakura	24414	74%	3%	1%
Franklin	18105	62%	4%	2%
Hamilton	17387	25%	49%	3%
Tauranga	13138	22%	5%	48%
Rotorua	10522	25%	6%	8%

Looking at the contributions to effective densities it can be seen that the cities within the Auckland region are largely self sufficient and the contributions from areas outside the region are relatively small. The level of employment in Hamilton would contribute about 1-2 per cent towards the overall effective density in Auckland reflecting the relatively small size of the labour pool and its distance from Auckland. Employment in Tauranga would contribute about 1 per cent to effective density in Auckland.

Hamilton's Contribution to Effective Density in Study Area

The contributions that activities in Hamilton make towards the effective densities are illustrated Figure A5.1:

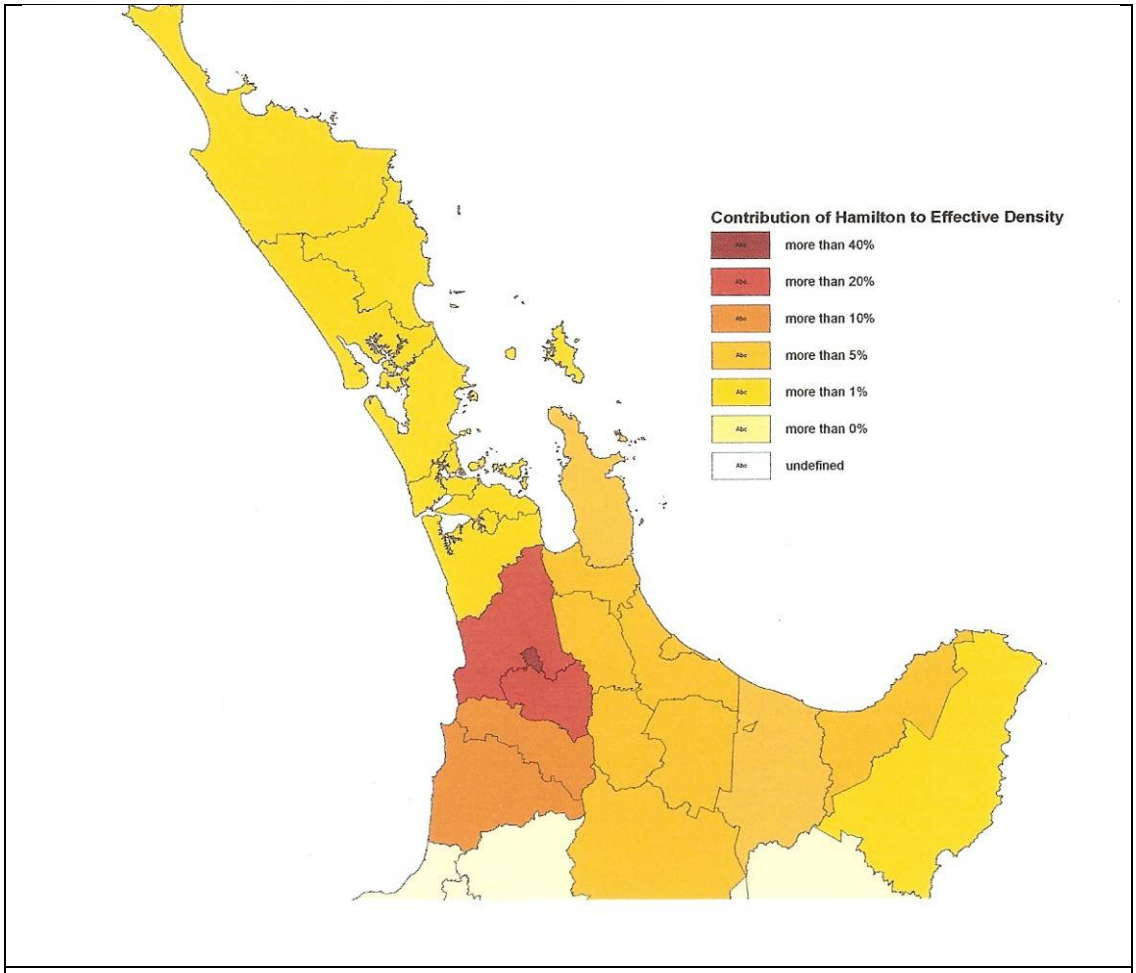


Figure A5.1
Contribution of Employment in Hamilton to Effective Densities

While activities in Hamilton make a fairly strong percentage contribution to the effective densities for the areas immediately surrounding the city and areas further south, the effects fall away fairly rapidly to the north where the influence of Auckland dominates and also to the east. There is also a relatively small interaction with activities in Tauranga.

Tauranga's Contribution to Effective Density in Study Area

The position for Tauranga is set out in Figure A5.2:

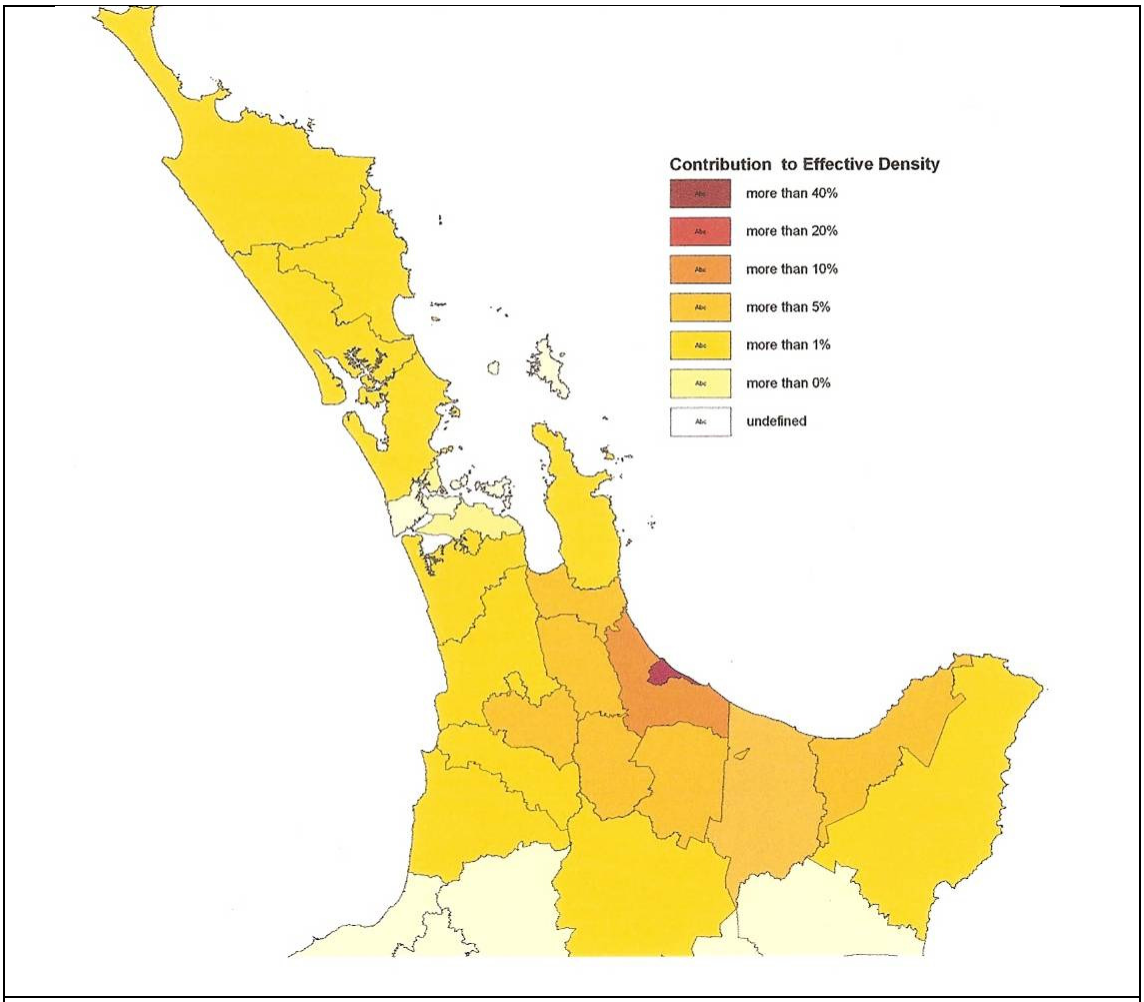


Figure A5.2
Contribution of Employment in Tauranga to Effective Densities

The interactions of Tauranga with its immediately surrounding area are more muted than those of Hamilton reflecting the lower employment levels in Tauranga (44,000 in Tauranga compared to 61,000 in Hamilton). For much of the remainder of the Bay of Plenty Region the contributions from Tauranga and Hamilton are similar, again reflecting the higher level of economic activity in Hamilton.

However looking at the contributions from Auckland to economic activity in Hamilton and Tauranga gives a very different position as can be seen Figure A5.3:

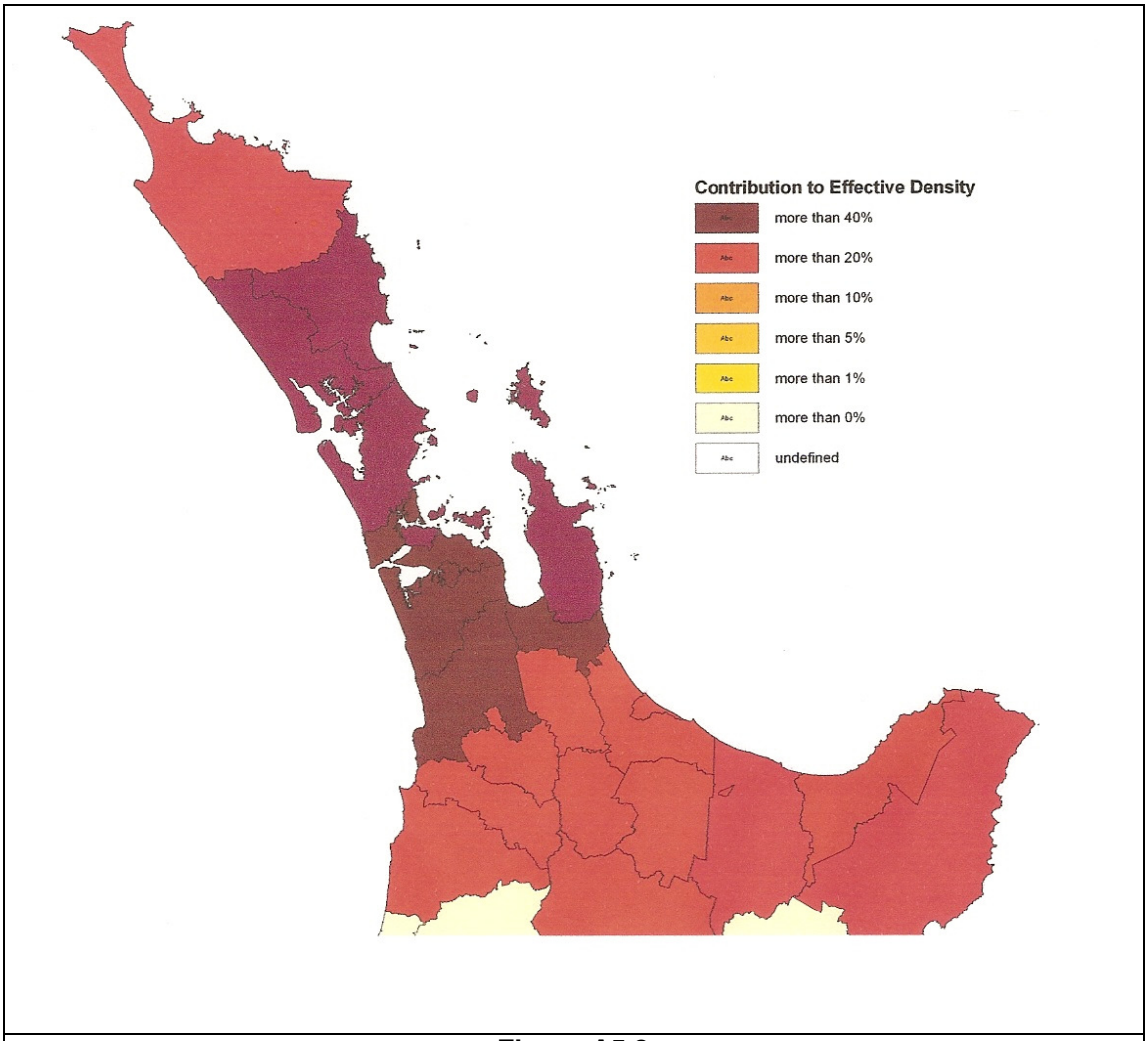


Figure A5.3
Contribution of Employment in Auckland Metro to Effective Densities

Across the region and in both the smaller cities, the contributions of Auckland to the effective densities are much greater reflecting the very large size of the employment base in Auckland and the opportunities it provides for interaction even given the distances between Hamilton and Tauranga and the Auckland Metropolitan area. Even with the distances between the two cities, Auckland contributes about 25 per cent to the total effective density in Hamilton and 22 per cent in Tauranga, giving a measure of the importance of Auckland in the levels of economic activity in the other two cities.

Using the same approach the level of interaction between Hamilton and Tauranga can also be measured. This effect is limited, with Hamilton contributing 5 per cent of the

total effective density in Tauranga and Tauranga contributing 3 per cent to Hamilton. These effects are much smaller than the contributions from the more distant Auckland.

The discussion above is based on the analysis of data from a variety of sources. While it has not been possible to calibrate the numbers from the more qualitative interview data that has been derived from discussions with a number of key stakeholders, the general findings from the numerical analysis, the limited interactions between Hamilton and Tauranga have been supported. The limited interaction is also supported by the data on commuting and on general freight patterns, which while measuring a different type of interaction gives the same general finding on the limited connections between the two cities.

Overall Findings

The key findings from the investigation of the potential interactions between the three cities in the study area include:

- The position is dominated by the levels of economic activity in Auckland which has a substantial potential influence on both Hamilton and Tauranga. This dominance is confirmed by the results of the interview programme where almost all the firms approached away from Auckland have had very substantial linkages with the Auckland area.
- The roles of the other two major cities are much smaller make only a small contribution to the overall effective density of Auckland.
- The analysis suggests that there is only very limited interaction between Hamilton and Tauranga, a conclusion which is borne out again by the results of the interview surveys. While they are important for the areas immediately surrounding them, their influence over a wider area is relatively small.

Impacts of changes in the levels of accessibility offered by the transport network

Having developed the regional agglomeration model, this can then be used to assess the impacts of changes in employment both directly and through their impacts on effective densities resulting both from changes in employment levels and from changes in measures of separation and in particular the effects of improvements to the transport network. By reducing separation, areas are able to interact more effectively and effective densities would increase. A similar effect would be achieved with increasing levels of employment. As a result, productivity per worker would be improved and increased output would be generated. The material set out in the EEM includes "agglomeration elasticities", the extent to which improvements in effective density are translated into improvements in the productivity of workers. The work describing out the analysis of these agglomeration elasticities in detail is set out in the NZTA Research Note 370.

The approach typically used by NZTA is based on estimates of GDP per head at a regional level. This does not provide any discrimination between areas within a region and an alternative approach based on earnings by workplace at a TLA level has been

investigated. The values from this have then been factored up to give GDP estimates using an average figure of 2.2 which gives the two approaches a common estimate for national GDP. However, the results from the two approaches were very similar and it was therefore decided to continue using the approach as defined by NZTA.

The effects of the possible improvements in output and also in worker productivity can be assessed in total and also by the area of incidence of these benefits ??.

Effects of Employment Changes

The effects of changes in the level and distribution of employment have been assessed for a number of scenarios. These include:

- **2041 Base Case** – Increase in employment assuming the same growth rates for population derived from the High Stats NZ projections. The process for deriving these has been described in the main report. This also assumes an increase in GDP before any agglomeration effects of about 1.7 per cent per year over the period to 2041. With these effects, the average growth rate would amount to 1.8 per cent per year. This then forms the base against which alternative land use and transport assumptions have been assessed.

- **Scenario 1** Employment growth in the three cities (Auckland Metro, Hamilton and Tauranga is at the average level predicted for NZ as a whole of 54 per cent for the period from 2006 to 2041, rather than the higher figures set out in Table 10.2.

- As a proxy for the relaxation of the MULs, employment growth has been spread more widely across the Auckland region than in the Base Case scenario. For this, we have assumed that employment in Auckland city would be 100,000 less than assumed in the Base Case with this distributed equally between the other constituent authorities. **(Scenario 2)**

- Effects of additional employment of 100,000 in Auckland in 2041, concentrated in the centre of the city **(Scenario 3)**

- Effects of employment increases of 100,000 in Hamilton and Tauranga, with this split equally between the two **(Scenario 4)**

- Effects of growth of sectors under the EGA. We have only been able to model these effects very approximately by assuming that with the EGA sectors the importance of interaction and the resulting agglomeration elasticities would increase. For this we have therefore assumed that the average agglomeration elasticity for the Auckland Metro cities increases to 0.087, the value estimated for the finance and insurance sector **(Scenario 5)**

- Reducing the travel times between the three cities to improve accessibility within the region **(Scenario 6)**, These have been estimated on the basis of the assumed travel time savings for the Waikato Expressway and a notional improvement in the route across the Kaimai Ranges on SH29 into Tauranga. The assumed travel time reductions are set out in Table A5.2

Table A5.2 Assumed Journey Time Improvements on Improved Road Links in AHT Study Area	
Waikato Expressway	
North of Hamilton	15 minutes
Hamilton Bypass	15 minutes
South of Hamilton	5 minutes
Total	**35 minutes**
SH29 Kaimai Improvement	**15 minutes**

- Reducing travel times within the three major urban areas **(Scenario 8**)

The results of the modelling of these scenarios is set out below:

Table A5.2 Results of RAM Modelling: Employment and GDP changes in the AHT Cities and Regions 2041

Scenario	Employment in AHT Cities	Total GDP in 2041 AHT Cities	
		Total Output ($bill)	% of Total in 2041
Current 2009	*583803*	*58.8*	*34%*
Position in 2041			
Base Case Total Employment and Output			
Base Case High Stats NZ growth	1032400	175.1	100%
Scenarios : Change from Base			
Scenario 1 Lower Growth Rate in employment in AHT cities	-131,000	-22.7	-13%
Scenario 2 Relaxation of MULs	-42,000	--13.9	-8%
Scenario 3 Increase of employment of 100,000 in Auckland City	+100,000	+21.7	+12%
Scenario 4 Increase of employment of 100,000 in Hamilton and Tauranga	+100,000	+14.8	+8%
Scenario 5 EGA scenario	0	+1.6	+1%
Scenario 6 Increased **inter**-urban accessibility	0	+0.1	+0%
Scenario 7 Increased **intra**-urban accessibility	0	+0.4	+0%

The baseline forecasts indicate that GDP in the AHT cities and in their regions is expected to grow substantially between 2009 and 2041. These are driven by increases in overall employment, with an increasing proportion in locations with higher value added where there is the opportunity to gain from the benefits of agglomeration resulting from the higher levels of activity. The key factors emerging from the examination of the scenarios are:

- GDP in the AHT cities (and regions) is very sensitive to the level of employment growth and its distribution.
- The low rate of growth tested in Scenario 1 would reduce GDP in the 3 cities by about 13 per cent.
- The more even spread of employment across the Auckland region tested in Scenario 2 analogous to the relaxation of the MULs would reduce GDP by 8 per cent. Across the 3 regions as a whole this would reduce output by 3 per cent, despite total employment being the same as the base.

- An increase in employment in Auckland City would increase GDP in the AHT cities by 12 per cent. The same level of increase in Hamilton and Tauranga would give an increase of 8 per cent.
- The modelling of the EGA scenario has suggested that this would result in a relatively small increase in GDP. This has however only been modelled very approximately and this figure may be underestimated possibly substantially. Further work would be required to investigate this further.
- The effects of increases in transport accessibility on overall regional output are relatively small (but possibly significant in relation to the investment undertaken). The benefits from improvements to intra-urban accessibility are much larger than those from improving inter-urban connections.

Overall, the model forecasts indicate that there are substantial benefits from encouraging employment expansion in the three cities and in particular in concentrating this in central Auckland (Scenario 3) rather than distributing this more widely across the Auckland region as might result from a relaxation of the MULs. In addition while there would be benefits from encouraging growth in Hamilton and Tauranga these would be smaller than the benefits from concentrating this in Auckland.

Appendix 6: Gravity Modelling of Commuting Flows

In order to investigate in more detail the patterns of commuting flows between the various locations within the Auckland-Hamilton-Tauranga study area, the development of a simple gravity model has been investigated. The purpose of this was essentially two-fold (only 2 points listed):

- To provide insights into the general patterns of commuting patterns within the corridor.
- To examine the effects of changes in conditions on current and potential future commuting patterns.

Approach

The gravity model developed is based on information at a TLA level including:-

- Resident workers;
- Numbers of jobs; and
- The separation between the different TLAs measured in terms of generalised costs which combines the time and distance component of the journey.

The numbers of resident and employed workers have been taken from census results for 2006 derived from the journey to work statistics and is based on a national total of 1.67 million workers for whom workplace addresses have been defined. While this may give numbers that are different to those from other sources, it does ensure consistency with the numbers travelling between the different areas.

Generalised costs have been calculated from estimates of travel times and distances between representative centres derived from Google Maps which are based on typical travel conditions. It is recognised that there are issues with this approach since:

- This probably tends to overestimate distance travelled since within the TLAs it is likely that there would be a higher propensity to commute from those closest to the destination.
- This may underestimate the time costs if there is considerable congestion at peak times.

Despite these qualifications it was considered that this approach would give useful insights into the patterns of commuting.

Form of the model

A standard formulation of the model has been used with the form

$$T_{ij}=k_i(G_i^a A_j^b / d_{ij}^d)$$

Where:

T_{ij} = the number of journeys between zones (TLA areas) i and j

G_i = the number of workers resident in zone i

A_j = the number of job in zone j

d_{ij} = the costs of travel between I and j

k_i is a factor to constrain the total number of trips from zone i to the numbers residing there (G_i) and

a, b and d are parameters which reflect the responsiveness of travellers to the various elements in the travel decision.

The calibration coefficients that were derived from a multiple regression analysis are set out in Table A6.1:

Table A6.1
Parameter Values for the AHT Commuting Gravity Model

Parameter	Parameter Value
a (Generation)	1.32
b (Attraction)	1.18
d (Separation)	2.34

All these coefficients were significant at a 95% confidence level.

Comparison between Observed and Estimated Movements

The comparison between the observed and estimated results for the gravity model for five major cities (Auckland City, Hamilton and Tauranga plus Rotorua and Whangarei) are set out in Figures A6.1 to A6.5:

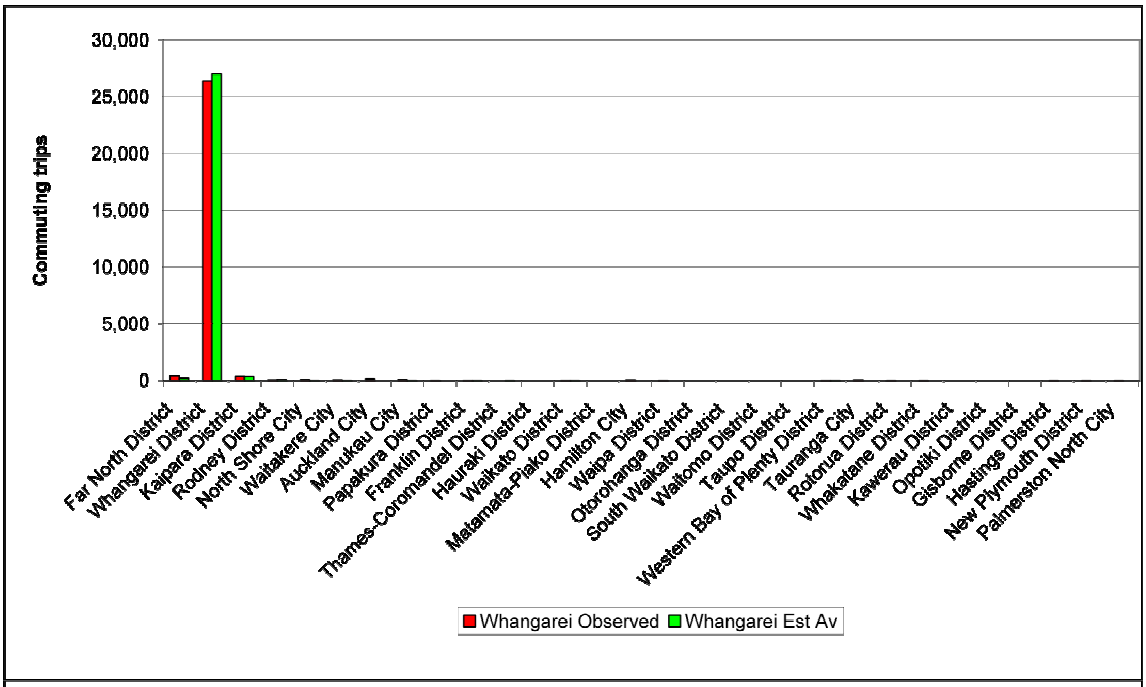


Figure A6.1
Gravity Model Results : Observed and Estimated Commuting Flows into Whangarei 2006

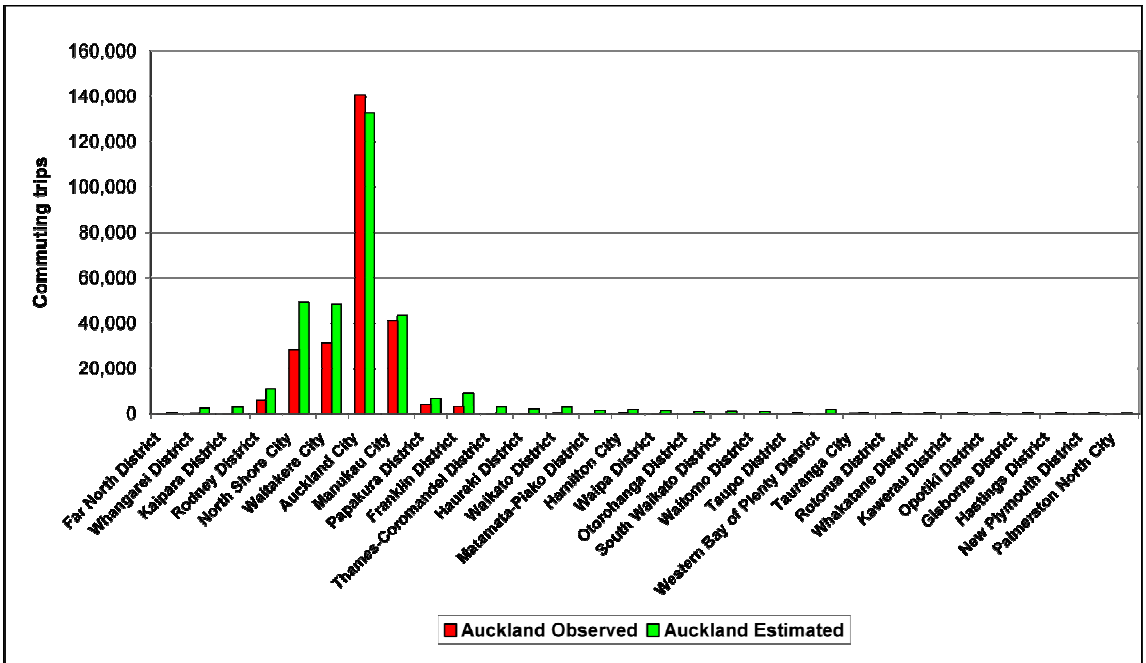


Figure A6.2
Gravity Model Results : Observed and Estimated Commuting Flows into Auckland City 2006

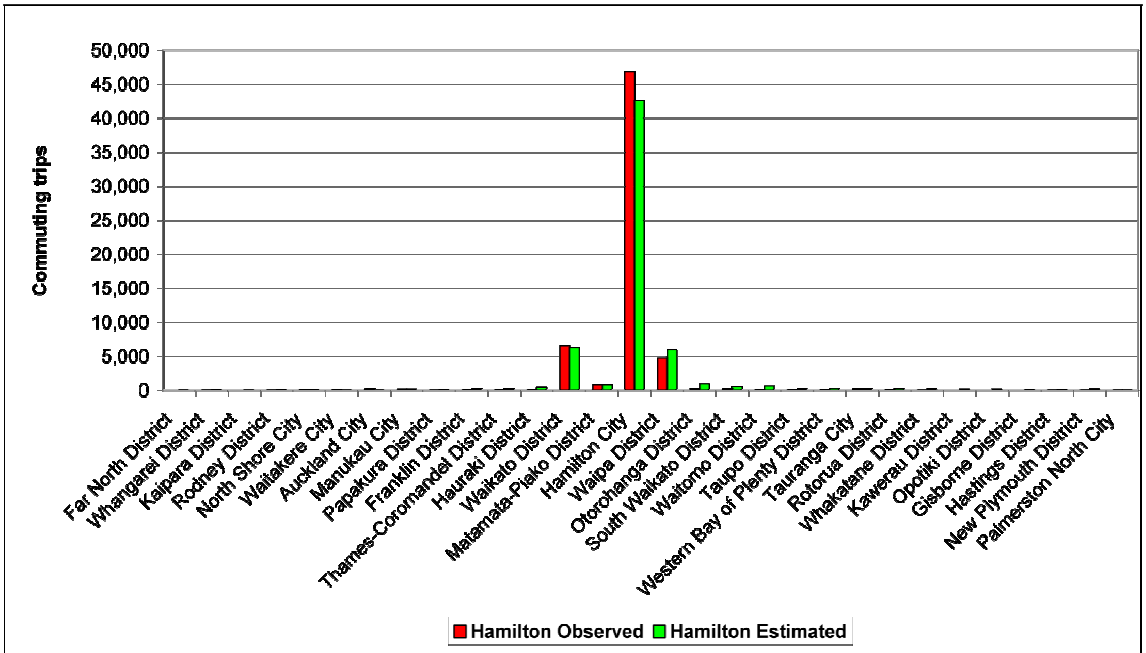


Figure A6.3
Gravity Model Results : Observed and Estimated Commuting Flows into Hamilton 2006

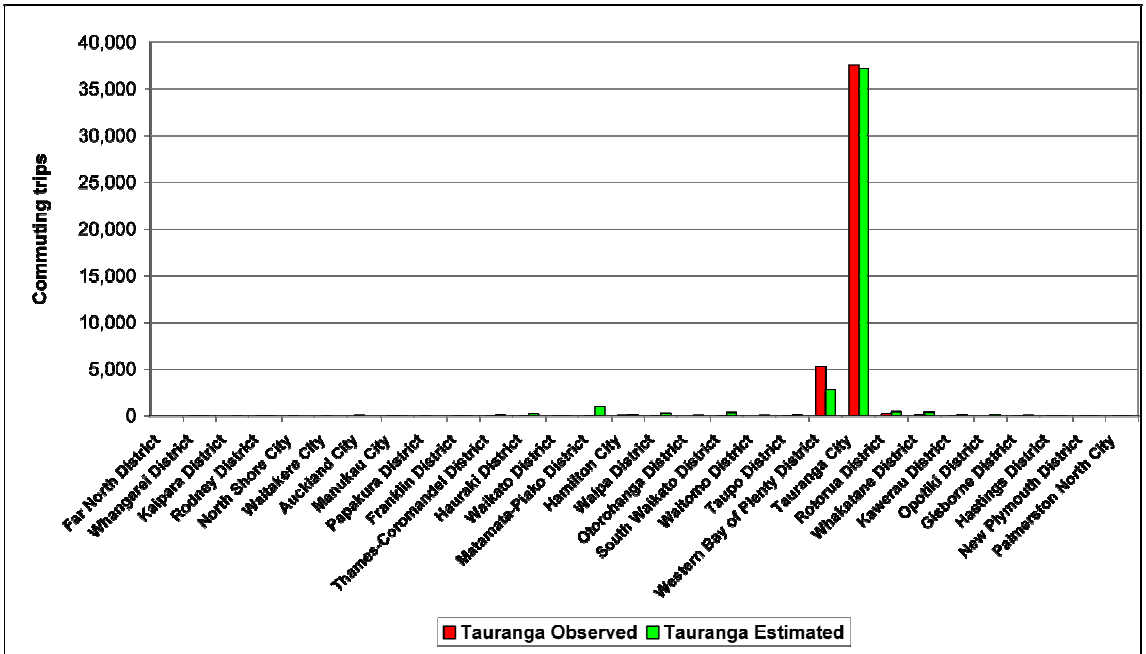


Figure A6.4
Gravity Model Results : Observed and Estimated Commuting Flows into Tauranga 2006

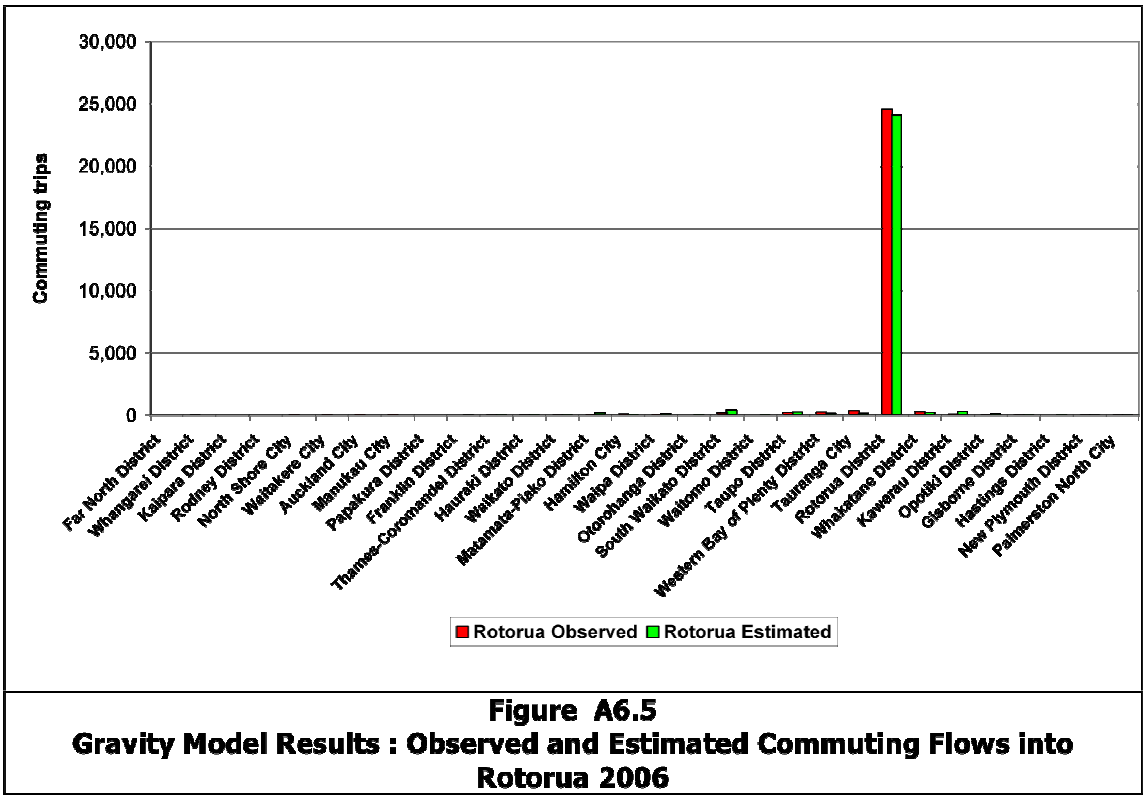


Figure A6.5
Gravity Model Results : Observed and Estimated Commuting Flows into Rotorua 2006

In general for all the cities except Auckland a very high proportion of the resident workforce is employed in the same area and the numbers commuting from outside the area are small. In practice therefore the gravity modelling has to be able to cope with this particular structure which can pose technical challenges and the formulation developed therefore represents something of a compromise between these two elements but with a high weight given to internal movements.

Reflecting this, in general the comparison between the observed and estimated results for the commuting movements within the cities which represent the large majority of flows is reasonably close, but there are often greater discrepancies between the numbers observed and estimated commuting from adjacent areas. In the case of **Auckland City**, this may reflect the effects of congestion at peak times which would tend to reduce the numbers from neighbouring areas and increase the numbers commuting within the city itself. For **Hamilton** there is a reasonably good match for the adjacent areas although for areas further afield the numbers estimated by the gravity model typically are higher than the numbers observed, suggesting a higher level of separation or a lower level of attractiveness than is incorporated in the model.

For **Tauranga**, there is a reasonably good match for internal commuting but the estimated movement of commuters from Western Bay of Plenty (WBOP) is substantially less than the number observed. In part, this may reflect a concentration of WBOP population or at least those commuting in areas close to the borders with Tauranga City, with a travel distance less than incorporated in the gravity model. It is however noticeable that the model tends to over predict longer distance movements.

Analysis of the Current Position

The main findings from the examination of the results of the gravity model and the patterns of commuting generally include:-

- In terms of the overall employment in the areas there is very little commuting over longer distances within the broad study area and each of the cities with the immediately surrounding areas is broadly self-sufficient in employment terms. This is the case even for Auckland City which has a very high level of employment.
- Because the numbers of longer distance movements are small in relation to the numbers of shorter distance movements, the gravity model has issues in replicating these in detail, typically but not always overestimating these. This suggests that other factors may play a relatively important part in longer distance travel decisions or that the separation parameter changes with distance, reducing the relative attractiveness of these longer distance movements.

Impacts of Possible Changes

The gravity model has been used to assess the changes in the patterns of commuting which might arise from increases in population forecast for 2041. Results for the three main cities are set out Figures A6.6 to A6.8 below. These assume no changes in commuting costs and do not take into account improvements to the transport network or general deterioration from increases in congestion.

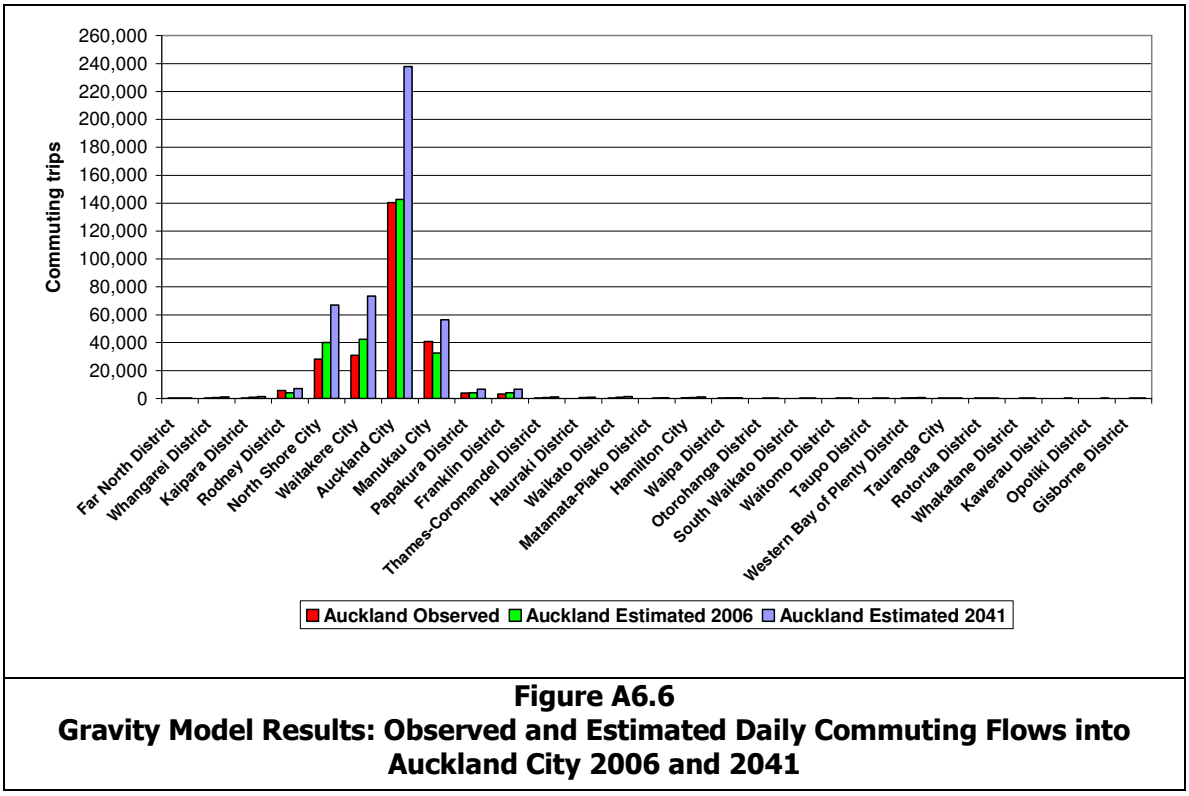


Figure A6.6
Gravity Model Results: Observed and Estimated Daily Commuting Flows into Auckland City 2006 and 2041

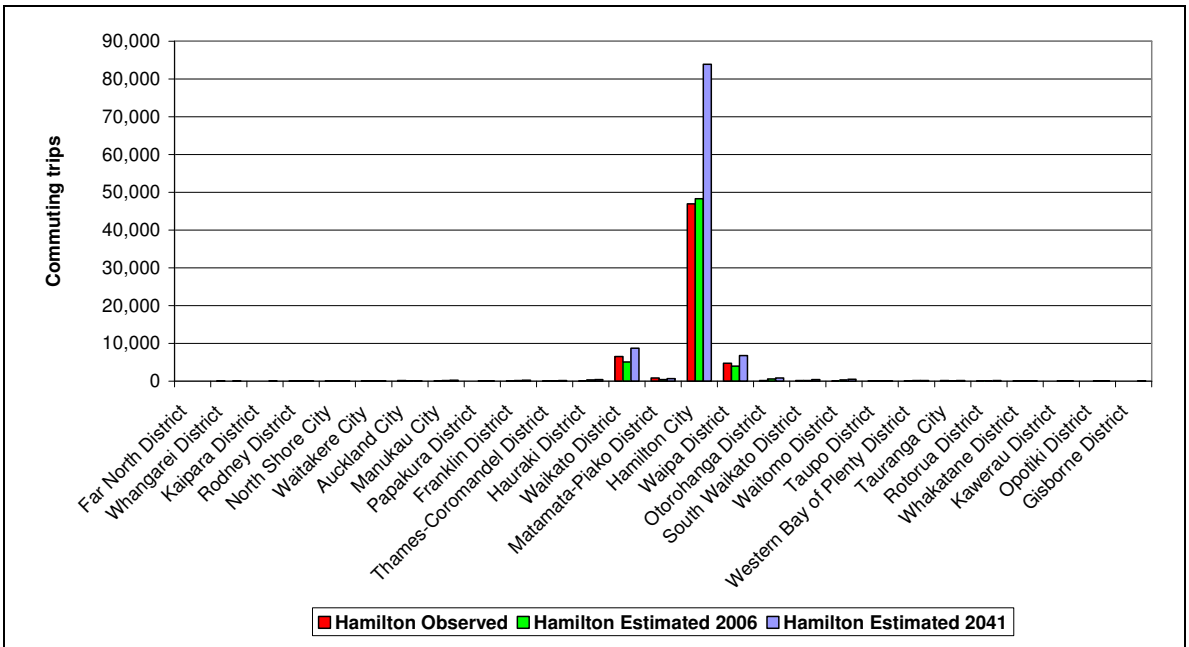


Figure A6.7
Gravity Model Results : Observed and Estimated Daily Commuting Flows into Hamilton 2006 and 2041

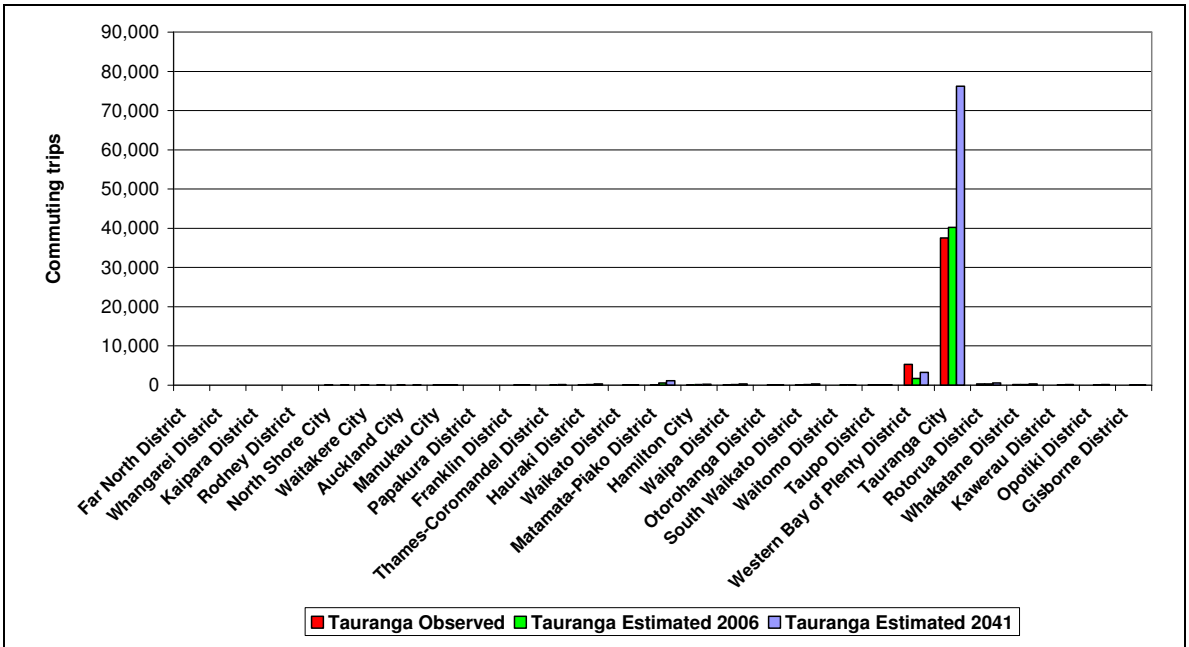


Figure A6.8
Gravity Model Results : Observed and Estimated Daily Commuting Flows into Tauranga 2006 and 2041

The examination of these indicates that in the absence of changes to transport conditions growth in employment in the cities is likely to be met from commuting from within the cities themselves or from their immediate vicinities and there would only be a very small impact on longer distance movements and on the levels of interactions between the cities.

The effects of possible notional changes in transport costs have also been examined. These are based on the simple assumption that over the period to 2041, transport costs within each of the areas identified and between the cities in the Auckland Metro area would rise by 30 per cent and that travel costs between areas would increase by 15 per cent, reflecting lower levels of congestion on inter-urban links. The results of this for Auckland City are set out in Figure A6.9.

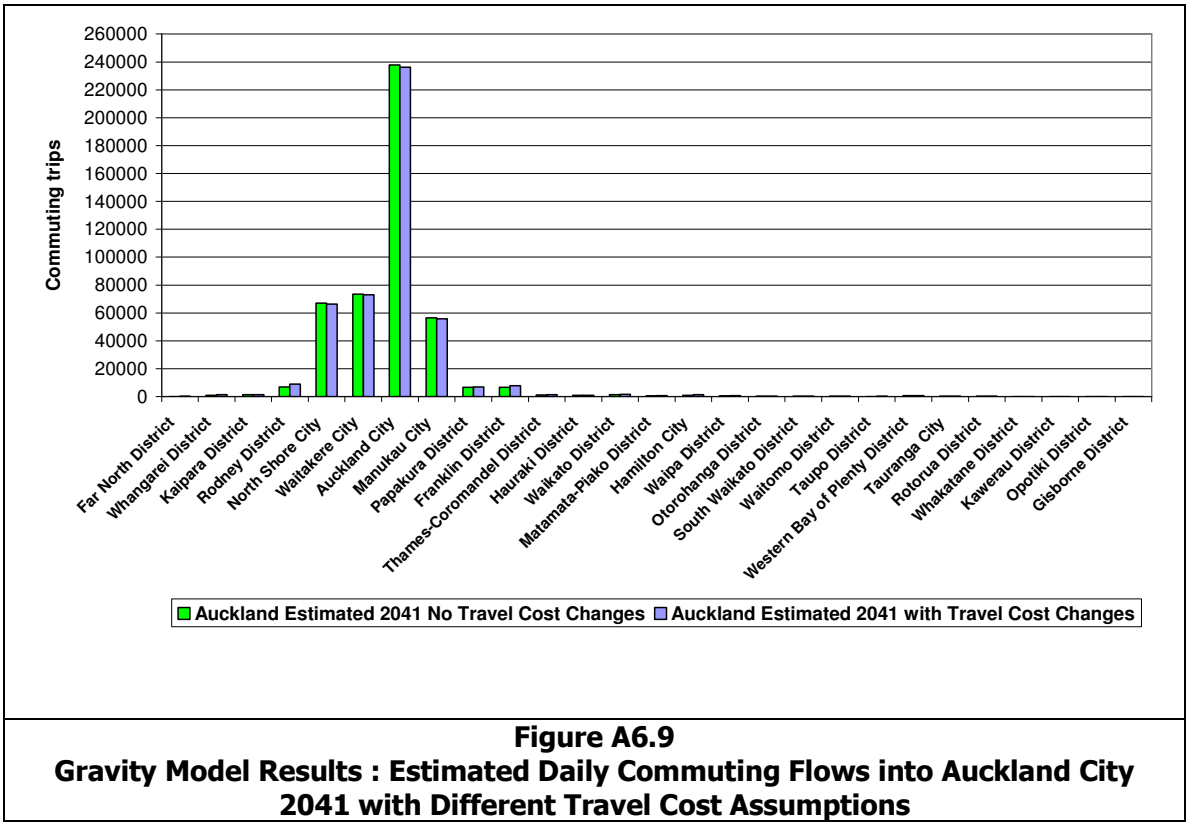


Figure A6.9
Gravity Model Results : Estimated Daily Commuting Flows into Auckland City 2041 with Different Travel Cost Assumptions

With the postulated changes in trip costs, the patterns of commuting remain broadly unchanged. With the balance between travel costs from outside the Auckland area increasing by less than those within the area, there is a slight increase in commuting from outside, but the overall impact is very small.

Overall Assessment for 2041

Overall therefore the analysis suggests that the position in 2041 is likely to be similar to that for 2006. Areas are likely to have a high degree of self-sufficiency in terms of their labour markets, and commuting between the major centres is likely to remain small.