

Part 4

Drivers of Economic Growth in Auckland

A report prepared for the Royal Commission on Auckland Governance

Covec

September 2008

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Contents: Drivers of Economic Growth in Auckland

| | |
|--|-----|
| Executive Summary | 103 |
| 1. Introduction | 107 |
| 1.1 A Step Change? | 108 |
| 1.2 Outline of the Report | 108 |
| 2. Growth Theory and Evidence | 109 |
| 2.1 Theoretical Review | 109 |
| 2.2 Macroeconomic Empirical Evidence | 111 |
| 2.3 City-Level Analysis | 113 |
| 2.4 Microeconomic Evidence on Growth | 115 |
| 3. Agglomeration and Growth | 116 |
| 3.1 Local Evidence of Agglomeration Effects | 118 |
| 3.2 Intra-Auckland Effects | 119 |
| 3.3 Transport and Land-Use Issues | 120 |
| 3.4 Urban Form | 121 |
| 4. Innovation | 122 |
| 4.1 Risks of Innovation | 123 |
| 4.2 Measurement Issues | 124 |
| 4.3 How is New Zealand Placed? | 124 |
| 4.4 Attracting Innovators | 126 |
| 5. Potential Drivers of Growth in Auckland | 127 |
| 5.1 National and Regional Policy Coordination | 128 |
| 5.2 Specific Policy Areas | 128 |
| | |
| List of Tables | |
| Table 1 Economic factors provided by cities | 113 |
| Table 2 Features of platform businesses and implications for regional growth | 115 |
| Table 3 Offsetting forces on agglomeration and economic growth | 117 |
| Table 4 Shares of territorial authority work location by residence | 120 |

Executive Summary

The purpose of this report is to review the state of knowledge on economic growth in Auckland. It is the second of two reports for the Royal Commission on Auckland Governance (“the Commission”); the first was focused on the composition and scale of the Auckland economy.

We start from the position that economic growth is desired, not for its own sake, but because and to the extent that it delivers sustainable increases in economic well-being to the population of Auckland. To make a difference to the lives of Auckland’s residents, we also need increases on a per-capita basis. That can happen only by attracting more capital and/or by innovating, both of which lead to increases in labour productivity.

It is common to use gross domestic product (“GDP”) per capita as the primary indicator of economic development. While we accept that this is a useful measure, the composition of GDP and ownership of the value created is important. Value added by firms, which contributes to GDP, is split between payments to the owners of capital and payments to workers. However, since large sections of the New Zealand and Auckland economies are foreign owned, and likely to remain so, the share paid to labour is particularly important. This fact should not lead one to neglect the pivotal role of entrepreneurs and risk taking in creating wealth.

Our earlier report showed a mixed picture of the Auckland economy. On the positive side, Aucklanders earn on average 20% more than other New Zealanders, and enjoy higher gaps between average income and median rent. GDP per worker is approximately 33% higher in Auckland than the rest of New Zealand combined. And productivity growth has been considerably higher in the manufacturing and business services industries in Auckland than elsewhere in New Zealand on average.

Nevertheless, the Auckland economy has not been growing much faster overall, and there is little evidence that it drives economic growth in other parts of New Zealand. Manufacturing, which is one of Auckland’s major employers and the second most significant creator of “flow-on” wealth, has shed 3.6% of its labour force over the past four years and shrunk from employing 16% of Aucklanders to 14%. The voluntary movement of population out of Auckland is also significant, even though those leaving are being replaced with new immigrants.

While Auckland does not currently seem to be driving the national economy, there is considerable potential for it to play a more significant role in the future. There is consequently a view that a step change is needed to get Auckland onto a new growth path. We fully endorse the desirability of such a change. It is most unlikely that any single project will be *the* catalyst for a new Auckland economy, but several projects could do so in combination. Some are already under way, such as addressing transport needs, and the Commission’s own focus on governance issues. These projects are contextual, but critical.

Economic Growth Theory and Empirics

The theory of economic growth is still evolving, having progressed through several stages. Since the 1980s, effort has centred on so-called “endogenous growth” models, in which the process of technological innovation is modelled explicitly. Various growth-promoting channels have been investigated, including education, the role of income distributions, and research and development (“R&D”) policies.

An important class of endogenous growth model is based on the ideas of Joseph Schumpeter, who argued that even apparently entrenched monopolies carry the seeds of their own demise, and will eventually be displaced through a process of “creative destruction”. This group of models yields some testable, and intuitively plausible propositions, including that the long-run rate of growth will increase with

- research and development productivity
- the flow of patents
- the rate of new firm creation
- the rate of exit of firms
- the rate of obsolescence of capital.

These factors are heavily oriented towards innovation as being the ultimate source of economic growth.

Empirical work has established several factors as being reliable drivers of growth:

- Stable prices (i.e. low inflation) are a necessary but not sufficient condition for sustainable economic growth.
- A robust and efficient financial sector is particularly important for allocating capital among the many business plans seeking support.
- Infrastructure investment, which is able to be influenced by regional government, also has solid support as an enabler of economic growth.

However, to the extent that these factors are amenable to public policy, most are the preserve of central rather than regional government.

Agglomeration

There is robust evidence to support the view that larger city/regions are more productive than smaller ones. In addition to international evidence, several local reports have recently identified these agglomeration benefits. In our view, the best of these reports was written by Motu researchers. It found evidence that “localisation” increases productivity but that “urbanisation” decreases it. Localisation refers to physical clustering by similar firms, whereas urbanisation is defined as the co-location of diverse firms. This is an internationally unusual result, and may suggest that greater attention to clustering is warranted in Auckland.

Given that agglomeration economies appear to exist in Auckland, the size of the resulting benefits is of interest. There is a wide range of size estimates internationally, with most suggesting that doubling the size of a city will increase productivity by between 3% and 8%.

Any productivity boost would help Auckland firms compete more effectively against those in other locations. However, considering the official projection of population growth in Auckland (43% over the next 24 years), even elasticities at the top end of the international range would result in (agglomeration-sourced) productivity gains of only 3% in total, spread over the next two decades.

Moreover, agglomeration also brings added costs. Large cities also contain forces that drive people away, and there is some Auckland evidence of such an effect for older working age people in our report on the composition and scale of Auckland's economy. The literature identifies land constraints as a key source of forces pushing people away from cities, and show up in land rents, the cost of commuting, and congestion. The resulting trade-off between the costs and benefits of greater population densities is an issue for regional government, impacting primarily on land-use and transport policy. These are matters on which some policy coordination is clearly warranted.

In summary, based on the available evidence, it seems clear that modest agglomeration economies will accrue gradually in Auckland, but they will not be a causative force that will transform the regional economy. Moreover, a larger and more dense population on which they rely also imposes costs, notably in the land markets.

Innovation

As discussed above, it is clear that innovation is the key to sustainable economic growth. Innovation involves the creation and application of knowledge. It occurs within established and start-up organisations of many types, but is notoriously difficult to measure. This is partly because it shows up in many different ways, such as new products, processes, and patents.

The available New Zealand data on innovation is split by industry rather than region. International comparative information is dated (2002–03) but indicates that New Zealand firms introduce new products at rates similar to European firms. We lag in R&D spending, being ranked 21 out of 31 Organisation for Economic Co-operation and Development (“OECD”) countries in R&D spending as a share of GDP.

The OECD has recently studied New Zealand's innovation system and concluded that it needs considerable work. Among other weaknesses, the OECD cites infrastructure weaknesses (including broadband, and Auckland's transport and electricity networks), lack of R&D investment incentives, barriers to business growth, and a dearth of relevant management skills.

Auckland is currently home to three business incubators, operated by universities (Auckland University of Technology, Massey University, and University of Auckland) and supported by New Zealand Trade and Enterprise. Funding has recently been announced

Part 4. Drivers of Economic Growth in Auckland

for a New Zealand Innovation Centre to be located at Auckland University's Tamaki Campus.

From the perspective of regional government, the attraction and retention of entrepreneurial and creative people is relevant to stimulating innovation. Attractive built environments, good transport, communication, and energy systems, and the fostering of cultural and social activities are important contributors to making Auckland attractive to innovators.

Auckland's role in the national economy

Our conclusion is that Auckland's economy does matter to the rest of New Zealand but that it is not currently acting as an engine of growth for the following reasons:

- Causal linkages between the economies of Auckland and other parts of New Zealand are weak.
- Although Aucklanders earn more than other New Zealanders, and their average GDP per capita is higher than the rest of New Zealand combined, the Auckland economy has not been growing much faster overall than in the rest of the country.

Nevertheless, there is evidence that the scale of the Auckland economy has helped to stimulate economic growth through agglomeration and innovation. To the extent that it can improve its performance in these areas, and manage the costs of further growth, Auckland has the potential to play a greater role in the national economy in the future.

1. Introduction

Sustainable increases in the wealth and incomes of New Zealanders require economic growth. But economic growth alone is not enough to ensure those increases, at least not if we use the usual measure (namely gross domestic product) as the yardstick.

GDP is a measure of the economic value added in a location. GDP increases with economic activity, but it indicates nothing about the ownership of the surplus (value added) created. For example, if a foreign-owned firm located in New Zealand launches an innovative new product and generates extra profit, the wealth/income of New Zealanders is affected only to the extent that it pays

- higher taxes
- more wages, and/or
- more for other locally supplied inputs.

For a range of reasons beyond its current control,¹ foreign ownership is a major force in New Zealand² and likely to remain so, at least until the wealth of New Zealanders increases significantly. From an economic perspective, this is not a concern in itself. However, it suggests that wage rates may be a better indicator of economic growth (as it affects New Zealanders) than GDP.

Wage rates and GDP measures are closely related. In the national income accounts, wages and profits are the two primary components of GDP. More fundamentally, sustainable increases in wage rates can flow only from profitable businesses, which are the primary driver of GDP. So while a focus on wage rates is appropriate, the nexus between wages and profits must not be forgotten.

Firms pay the wage rates required to elicit adequate supplies of suitable labour. If markets were fully competitive, the productivity of labour would create a benchmark for wage rates. Firms would find it difficult to secure labour if they paid less, and difficult to sell their outputs if they paid more. These very clear predictions are weakened somewhat by the fact that everyday markets are only “workably” rather than fully competitive. However, labour productivity remains an important benchmark for wage rates and for economic growth more generally.

Economic Development Indicators 2007, recently published by Ministry of Economic Development, The Treasury, and Statistics New Zealand,³ uses GDP per capita as its headline measure. However, it views this as being primarily driven by labour utilisation

1 Relevant factors include the free movement of capital across borders, relocation of manufacturing to low-wage economies, and New Zealand being slow to build major pools of investment capital.

2 Statistics New Zealand data show that at the end of December 2007, foreign investment in New Zealand was 2.3 times the level of New Zealand investment offshore.

3 http://www.med.govt.nz/templates/MultipageDocumentTOC_____32722.aspx

Part 4. Drivers of Economic Growth in Auckland

(how much work is done) and labour productivity (how effective that work is at generating wealth). Of the latter, the report says (and we concur),

The most important contributor to increasing incomes per capita is increasing productivity, or output per hour worked.

1.1 A Step Change?

The evidence presented in the companion paper (“The Composition and Scale of Auckland’s Economy”) suggests that the region’s economic growth is broadly similar to that of the rest of New Zealand. If Auckland were a primary engine of economic growth in New Zealand, we would instead expect to see a clear gap in Auckland regional growth relative to New Zealand growth in aggregate.

There is a sense that a step change is required. It is apparent in the Government’s economic transformation agenda, and in the focus central government politicians of all parties attach to getting Auckland onto a new trajectory. We fully endorse the desirability of such a change. However, since the ultimate source of economic growth is business-related innovation, there are limits on the ability of local and regional governments to stimulate it.

Focusing on what could be done, it is reasonable to divide initiatives into two groups. One is contextual, meaning the creation of an environment that is conducive to innovation. In this report, we review the literature and evidence on determinants of economic growth and identify attributes of the context for business that are amenable to influence by regional government.

Getting the context right is an important part of the solution, but experience with market creation and development (see section 2) suggests that a fertile environment is not enough to create rapid growth. One or more catalysts are also needed to start or accelerate a growth cycle. It is most unlikely that any single project will be *the* catalyst for a new Auckland economy, but several projects could do so in combination.

1.2 Outline of the Report

The balance of this report is in four sections:

- Growth theory and evidence is reviewed in section 2.
- Issues related to agglomeration are covered in section 3, which includes commentary on infrastructure, transport and land use.
- Innovation is discussed in section 4.
- Our conclusions about the potential future drivers of economic growth in Auckland are summarised in section 5.

2. Growth Theory and Evidence

This section offers a brief review of the state of knowledge on economic growth, first from a theoretical perspective (section 2.1) and then through the existing empirical work (section 2.2).

2.1 Theoretical Review

Economic growth theory attempts to explain why economies grow over time and what determines the rate at which growth occurs. It is motivated by the observation that countries have grown at different average rates in the past, and consequently some countries are much richer than others.

In general, the amount of output (commonly measured as GDP) that an economy can produce in a given amount of time is constrained by the resources that it has and the efficiency of the production technologies available for turning these resources into goods and services that people want to consume. This suggests that growth can be achieved in two basic ways:

- by increasing the quantity of resources that the economy has, and/or
- by improving production technology to make the use of existing resources more efficient.

As a result, the theory of economic growth is actively being developed by economists in at least two main directions, corresponding to each of these two channels for growth.

Regarding the first channel, resources are typically defined as labour, physical capital (plant, machinery, and so on), land, and other natural resources such as oil and minerals. If the quantity of any of these resources increases, the economy will grow. Thus, for example, population growth is one reason why economies grow over time, as the quantity of labour increases.

Of all the types of resources, growth in the stock of physical capital is thought to be the one most amenable to policy interventions. This is because investment in physical capital is constrained by the rate of savings in the economy in the long run. This is the basis of what is known as “neoclassical growth theory”, which attempts to explain differences in growth rates as being largely because of differences in savings rates.

A very simple equality linking the savings rate (s), the capital-output ratio (K/Y) and the growth rate of the labour force (gL) emerged from neoclassical growth theory:

$$(1) \quad s = \frac{K}{Y} gL$$

This equality was regarded as the basic condition under which an economy would grow at a constant rate. Total savings (sY) were available for reinvestment in the capital stock K ,

Part 4. Drivers of Economic Growth in Auckland

and adding either capital or labour led to increased output – i.e. to growth. This last fact (adding inputs increases output) is true very generally, though it will often also be true that the output boost per additional input unit will be smaller and smaller as more inputs are added (known as diminishing returns). There are consequently limits on the extent to which the mere addition of inputs is desirable.

The early neoclassical growth theorists⁴ realised that none of the three terms in equation (1) were in fact constant. The savings rate (s) depends on how patient people are (the so-called rate of time preference) and the interest rate. These can and do change over time, and can be influenced by policy. Similarly, the growth rate of labour (gL) depends on labour supply preferences, fertility levels, and immigration rates among other things. Finally, the capital intensity of production will change over time with the industrial structure of the economy and with technological innovation.

Analytical attention was focused initially on enriching the way technology was represented in the model; this led to explicit modelling of the capital intensity term (K/L), which allowed researchers to demonstrate that an economy could achieve long-run growth under a reasonably wide range of input assumptions. This led in turn to an interesting practical result. It was demonstrated that the long-run rate of output growth per unit of labour input depended only on the rate of technological progress and in particular was independent of the savings rate.

This focus on technological progress is also at the heart of the second main branch of growth models, based on what is known as “endogenous growth theory”. This line of work began in the 1980s and has attracted an enormous research effort. Endogenous growth models take a broad view of technological progress, recognising for example that additional training is an investment in “human capital” (or the skill level of workers) that is analogous to more traditional investments in fixed assets.⁵ By concentrating on the process of technological innovation, endogenous growth models are able to study the way that policy makers can influence economic growth. Technological innovation is assumed to raise the productivity of all resources, which can generate growth even if the quantities of resources remain constant.

The main aim of this branch of the literature is to explain how economies can continue to grow over time, without relying on external (non-economic) factors such as population growth or discovery of new natural resources, and thereby avoid the growth-slowness effects of diminishing returns. Such models include the process of technological innovation within the model itself and explain how this occurs as a natural result of the operation of the economy. These models also help to identify the factors that influence the rate of technological progress and thus the rate of growth. A very large range of theoretical endogenous growth models have been developed, studying the role of education, how income distribution affects growth, the impact of different market structures, and the effect of policies designed to stimulate research and development.

4 An interesting summary of this line of work is provided in Robert Solow’s Nobel Prize lecture (<http://nobelprize.org/economics/laureates/1987/solow-lecture.html>).

5 This is not unique to endogenous growth models, however, and was recognised well before endogenous growth theory emerged, by Frankel (*American Economic Review*, Vol. 52, 1962, pp. 995–1022) for example.

An important class of endogenous growth model is based on the ideas of Joseph Schumpeter,⁶ who argued that even apparently entrenched monopolies carry the seeds of their own demise, and will eventually be displaced through a process of “creative destruction”. This group of models yields some testable propositions,⁷ including that the long-run rate of growth will

- increase with
 - research and development productivity
 - the flow of patents
 - the rate of new firm creation
 - the rate of exit of firms
 - the rate of obsolescence of capital
- decrease with
 - the interest rate
 - the rate of quitting by workers
 - the cost of hiring new workers.

Most of these propositions are intuitively plausible. The fact that firm exit and capital obsolescence are predicted to increase the growth rate stems from the idea that these changes are caused by innovation, which is inherently productive. So the fact that institutions such as firms are changing and capital is being written off more quickly merely indicates that there is more innovation and hence more growth.

In reality, growth likely occurs through a mix of neoclassical (savings-driven) and endogenous (technology-driven) channels. From a policy point of view, this means that policies that encourage (or at least do not discourage) savings, and create an environment in which technological innovation can occur are most likely to promote economic growth.

2.2 Macroeconomic Empirical Evidence

While it is clear that innovation is the ultimate source of economic growth and development, the means by which innovation can be fostered and promoted is less clear. In this section we summarise the empirical literature on macroeconomic growth. This is complemented in section 2.4 by analysis at the level of individual markets.

There is surprisingly little convincing empirical macroeconomic evidence on the determinants of growth. An important reason is that accurate and consistent measures of the variables of interest are difficult to obtain. Secondly, the impact of un-modelled

6 Schumpeter, J.A., *The Theory of Economic Development*, Harvard University Press, Cambridge, MA, 1934.

7 Aghion, P. and Howitt, P., *Endogenous Growth Theory*, MIT Press, Cambridge, MA, 1998, Chapter 12, “Testing for Endogenous Growth”.

but important economic shocks (e.g. to oil prices) and general trends such as increasing globalisation of business activity and the formation of trading blocs, tend to obscure the effects under study.

Nevertheless, some things can be said. First, it seems that stable prices (i.e. low inflation rates) are a necessary, though not sufficient, condition for growth. Secondly, a robust and efficient financial sector is extremely important, since it is this sector that determines which of the myriad competing business plans will obtain debt and equity finance.

It is commonly believed that infrastructure investment is an enabler of growth in the sense that it allows the development of a range of private commercial activities that would otherwise not be feasible. This proposition has found solid support in empirical studies such as that of Easterly and Rebelo (1994).⁸ Also worthy of note is a regional analysis of public investment in Spain,⁹ which confirmed the role of infrastructure as a promoter of growth but also identified some interesting inter-regional spillover effects. The growth impact of regional investment in transport infrastructure was shown to affect neighbouring regions because it facilitated transport in and out of those regions. Thus, improvements in Auckland's transport infrastructure might well stimulate growth on the fringes of Auckland and in neighbouring regions more than in central parts of Auckland.

An international comparison of social returns to infrastructure spending has sounded a word of warning about infrastructure spending, however:

High rates of return to infrastructure are the exception rather than the rule, making the case for large scale investment in infrastructure depend on an analysis of a country's characteristics rather than a blanket prescription or sector-specific rules or schemas.¹⁰

Education, and skill development more generally, plays an important but nuanced role in stimulating economic growth. There is some evidence of diminishing marginal returns to education, so that the early stages of education provide the greatest gains. However, in aggregate, education also seems to be capable of accelerating growth, with the average level of educational attainment being positively correlated with the growth rate of output.¹¹

The connection between income inequality and economic growth has received considerable attention in the modern literature. However, the nature of the relationship

8 Easterly, W. and Rebelo, S., "Fiscal Policy and Economic Growth: An Empirical Investigation", National Bureau of Economic Research, Cambridge, MA, *NBER Working Paper W4499*, 1994.

9 Pereira, A. and Roca-Sagales, O., "Spillover Effects of Public Capital Formation: Evidence from the Spanish Regions", Department of Applied Economics at Universitat Autònoma of Barcelona, *Working Paper wpdea0210*, 2002 (available at <http://ideas.repec.org/p/uab/wprdea/wpdea0210.html>).

10 Canning, D. and Bennathan, E., "The Social Rate of Return on Infrastructure Investments", World Bank, Washington, DC, *World Bank Policy Research Working Paper 2390*, 2000.

11 Benhabib, J. and Spiegel, M. "The Role of Human Capital and Political Instability in Economic Development", Chapter 2 in M. Baldassarri, L. Paganetto, and E. Phelps (eds), *International Differences in Growth Rates*, St Martins Press, New York, 1994.

Table 1 Economic factors provided by cities

| Factor | Example |
|------------------------------|-----------------------------|
| Scale economies | |
| in production (within firms) | larger plant sizes |
| in consumption | parks, libraries, etc. |
| Shared inputs | |
| in production | accounting & legal services |
| in consumption | theatres, restaurants |
| Transactions costs | |
| in production | labour market matching |
| in consumption | shopping malls |
| Statistical economies | |
| in production | lower unemployment |
| in consumption | lower inventory levels |

Source: adapted from Quigley, 1998.

is far from settled. No sooner had a 1996 survey¹² of the field found a consistent message that initial inequality is detrimental to long-run growth, than new work using a richer set of “panel data” found the opposite.¹³ One theoretical reason supporting the idea that inequality promotes growth is that it leads to a situation where more than half of the population (the poorer half) are in favour of higher taxation to finance public education, which will increase human capital and therefore increase growth. On the other hand, inequality itself could have adverse welfare (well-being) effects that are greater than the well-being gains from any growth created by inequality.

2.3 City-Level Analysis

The literature discussed above is mainly concerned with growth at the level of a national economy. There is also a body of work that considers cities and regions more specifically, both in theory and through empirical analysis. An accessible survey of much of this material is provided by Quigley,¹⁴ who discusses four economic factors that cities provide. These are summarised in Table 1.

If there are production-side economies of scale, the unit cost of production can be reduced when larger markets are being supplied. So, when transport costs are significant, it is cheaper to supply the larger markets found in cities than to service smaller communities. On the consumption side, the more people located in proximity

12 Benabou, R., “Inequality and Growth,” in Ben S. Bernanke and Julio J. Rotemberg (eds), *NBER Macroeconomics Annual 1996*, Vol. 11, MIT Press, Cambridge, MA, 1996, pp. 11–92.

13 Forbes, K.J., “A Reassessment of the Relationship Between Inequality and Growth”, *American Economic Review*, Vol. 90(4), 2000, pp. 869–887.

14 Quigley, John M., “Urban Diversity and Economic Growth”, *Journal of Economic Perspectives*, Vol. 12(2), 1998, pp. 127–138.

Part 4. Drivers of Economic Growth in Auckland

to a park, the greater the value derived from it, though there can also be an offsetting congestion effect. Scale economies of this type are often grouped under the heading of “agglomeration effects”. They are discussed in more detail in section 3.

“Shared inputs in production” refers to the idea that some services are most efficiently contracted in. Firms do not need to retain full-time employees for all functions, and a city can support firms that specialise in providing contract labour. On the consumption side, theatres and restaurants are more commercially viable when they can draw from a larger pool of potential customers.

The cost of arranging many transactions is lower within cities than between cities or within smaller groupings. Firms are more easily able to locate suitable labour in cities, so firms that require frequent access to deep labour markets are more likely to locate in cities. And their presence makes cities attractive for workers as well. On the consumption side, cities are able to support a wider range of retail outlets, and clustering in shopping districts and malls reduces search costs for consumers.

Finally, cities can deliver some benefits simply through the operation of laws of large numbers unless fluctuations are highly correlated across decision makers. For example, if good and bad trading periods occur for firms at different times, workers may be able to shift between firms in a way that reduces unemployment overall. And if variations in product demand by different purchasers is similarly uncorrelated, the overall pattern of demand will be smoother, allowing firms to hold lower levels of inventory.

These fundamental economic benefits arise from the diversity that can be supported in a city. As Quigley says,

*Diversity and variety in consumer goods or in producer inputs can yield external scale economies, even though all individual competitors and firms earn normal profits.*¹⁵
[author’s italics]

There is a large body of empirical literature that supports this idea. It has been convincingly shown that productivity is higher in larger cities, that co-location in cities directly fosters innovation, and that larger cities contribute more than proportionately to national output. Another quote from Quigley summarises:

no matter how the results are described, it remains clear that the increased size of cities and their diversity are strongly associated with increased output, productivity, and growth. Large cities foster specialization in production and sustain a broader range of final products, increasing the returns of their firms and the well-being of their residents.¹⁶

It is of course true that ongoing expansion of cities can lead to some undesirable features, and that there are consequently limits to how much one might want a city to grow, or what it would cost to do so. These issues are considered in the following section.

15 Ibid., p. 133.

16 Ibid., p. 136.

Table 2 Features of platform businesses and implications for regional growth

| Issue | Platform interpretation | Regional growth interpretation |
|-----------------------------|---|---|
| Getting both sides on board | No value is created without interaction between agents of different types | |
| | Buyers and sellers are the agents | Workers and entrepreneurs are the agents |
| | Each type of agent needs a reason to join the platform or locate in the region | |
| Balancing interests | Demands differ between buyers and sellers | Workers and entrepreneurs have different needs |
| | Prices are different for each type | Distinct policies required for each |
| | Viewed in isolation, some user types seem to be subsidised This is often efficient because subsidising and subsidised users may both benefit | |
| Multihoming | One type of user often joins two or more platforms, e.g. merchants accept many payment cards | Workers are in one place Entrepreneurs may be active in several places at once |
| | | |
| Scaling and liquidity | Successful platforms start small | Persistent small-scale experimentation seems appropriate |
| | Adjustments are made as learning occurs | Disciplined learning and revision strategy needed |
| | Very difficult to predict the best structure before testing some | |

2.4 Microeconomic Evidence on Growth

An alternative way of looking at economic growth is at the level of individual markets. So-called “platform” businesses offer a useful insight into the way markets are created and stimulated. Examples of platform businesses include

- the stock exchange
- the Visa credit card network
- Trademe.

These businesses are also markets. Their development has several similarities to regional economic development:

- The objective is to attract traders, who are motivated by their own self-interest.
- Each competes with other locations that traders could alternatively use.
- There are valuable spillover benefits from concentrating trade in one location.
- Successful development is a very deliberate and calculated process.

A recent review of platform businesses¹⁷ identifies several issues that occur repeatedly in platform business development. Table 2 summarises these issues and our interpretation of the corresponding implications for regional economic development.

While it is admittedly unusual to think of regional economic growth in this way, the implications of doing so are broadly consistent with conclusions drawn from other forms of analysis. It is clear, for example, that ongoing regional economic growth requires that entrepreneurs and workers view Auckland as a desirable location. For workers, that implies a commitment to being based only in Auckland, whereas entrepreneurial firms may simply need to add an Auckland location to a larger network of business sites.

The implications of the scaling issue in the table are also useful. They suggest that Governments attempting to stimulate growth should adopt a disciplined approach involving pilot trials, careful assessment, and revision before committing to large-scale programmes.

3. Agglomeration and Growth

As discussed above, cities and city-regions enjoy a range of economic advantages compared with less densely populated areas. However, while there is sound evidence that productivity is higher in such locations,¹⁸ the mechanisms through which this occurs are less well understood, as are the policy implications. For example, there is not a clear causal connection between increasing population or job density and increasing productivity. Causality could run in the other direction, or both might be caused by a third factor such as fortunate location.

It seems very likely that Auckland's population will continue to grow. Internationally, the size distribution of cities within a country has shown a strong empirical regularity sometimes referred to as the rank-size rule.¹⁹ It predicts that the Nth largest city in a country will have a population equal to one-Nth that of the largest. For example, the 4th largest urban population will be $\frac{1}{4}$ of the largest, and so on. This rule works reasonably well for the 31 largest urban areas in New Zealand, though the Auckland area is slightly larger than it predicts.

Notwithstanding the lack of clearly established causality, agglomeration theory is generally thought of as predicting that *productivity* in Auckland will increase as the region gains population. Internationally, there is a wide range of estimates of the size of this

17 Evans, David, "Some Empirical Aspects of Multi-sided Platform Industries", *Review of Network Economics*, Vol. 2(3), 2003, pp. 191–209.

18 Ciccone, A., "Agglomeration Effects in Europe", *European Economic Review*, 46: 213–27, 2002; Ciccone, A. and Hall, R.E., "Productivity and the Density of Economic Activity", *American Economic Review*, Vol. 86, 1996, pp. 54–70.

19 For example, Rosen, K., and Resnick, M., "The Size Distribution of Cities: An Examination of the Pareto Law and Primacy", *Journal of Urban Economics*, Vol. 8(2), 1980, pp. 165–86.

Table 3 Offsetting forces on agglomeration and economic growth

| Centripetal forces | Centrifugal forces |
|----------------------|---------------------|
| Linkages | Immobile factors |
| Thick markets | Land rent/commuting |
| Knowledge spillovers | Congestion |

Source: Fujita, Krugman, and Venables, 2001. See text for interpretation.

effect; they are typically framed as a percentage increase in productivity as a result of doubling the size of a city. Most estimates range from 3% to 8%.²⁰

Any productivity boost would help Auckland firms compete more effectively against those in other locations. However, considering the official projection of population growth in Auckland (43% over the next 24 years), even elasticities at the top end of the international range would result in (agglomeration sourced) productivity gains of only around 3% spread over the next two decades.

It is also important to note the limits to the benefits agglomeration can provide. In their groundbreaking work on the “new economic geography”, Fujita, Krugman, and Venables (henceforth “FKV”)²¹ describe a tension between centripetal and centrifugal forces. Centripetal forces are the agglomeration benefits that attract population and capital into cities in search of better returns. However, there are also repelling (centrifugal) forces associated with greater density, such as congestion and higher land values. These repelling forces may be contributing to departures from the Auckland region by older workers, as noted in our companion paper (“The Composition and Scale of Auckland’s Economy”).

There is consequently merit in developing a deeper understanding of the forces that attract and repel economic activity. FKV summarise these as shown in Table 3.

A brief description of these forces follows:

- Linkages are simply trading relationships. Firms have forward linkages into the markets they supply, and backward linkages into markets from which they acquire inputs (labour, materials). Because trade is easier with proximate partners, linkages promote co-location and help agglomerations to stimulate economic growth.
- Thick markets refers to the idea that any trader prefers competition to be more intense on the *other* side of the market. Thus, buyers prefer to have offers from many sellers, and vice versa. Thick markets increase the likelihood of trading at a “good” price.

20 Examples include Nakamura, R., “Agglomeration economies in urban manufacturing industries: A case of Japanese cities”, *Journal of Urban Economics*, Vol. 17(1), 1985, pp. 108–124; Soroka, L.A., “City Size and Income Distributions: The Canadian Experience”, *Urban Studies*, Vol. 21(4), 1984, pp. 359–366.

21 Fujita, M., Krugman, P., and Venables, A.J., *The Spatial Economy: Cities, Regions, and International Trade*, MIT Press, Cambridge, MA, 2001.

Part 4. Drivers of Economic Growth in Auckland

- A knowledge spillover is a purely external benefit gained as a result of observation. They can arise within firms (as new recruits “learn by doing”) and within trading relationships, as firms learn about new ways of operating.
- The most important immobile factor is land, but people are often also relatively immobile, at least in the short run. The fact that it is not possible to add more land to a location, and not easy to shift people out, increases the cost of living in an urban location. Increasing costs of land rent and commuting are two symptoms of immobile factors, as is congestion.

In summary, the international work on agglomeration suggests that there are some benefits to be gained from greater population densities, in the form of higher productivity. However, there are also offsetting costs associated with higher land prices and more general congestion effects. We now consider the local evidence on agglomeration.

3.1 Local Evidence of Agglomeration Effects

We have reviewed four studies of agglomeration effects in New Zealand. They are

- *Assessing Agglomeration Impacts in Auckland: Linkages with Regional Strategies*, report by Ascari Partners for Auckland Regional Council, February 2007.
- “Geographic concentration and firm productivity”, by David C. Maré & Jason Timmins, Motu Economic and Public Policy Research, *Motu Working Paper 06–08*, October 2006.
- “Regional Economic Performance in New Zealand: How Does Auckland Compare?”, by Geoff Lewis and Steven Stillman, *New Zealand Treasury Working Paper 05/08*, November 2005.
- “Labour productivity in Auckland firms”, by David C Maré, Motu Economic and Public Policy Research, *Motu Working Paper 08–12*, June 2008.

These studies all derive empirical estimates of the importance of agglomeration effects, but they do so in different ways.

Ascari used 2001 census data for the Auckland region by employment location and looked for correlations between average wages and job densities (jobs/hectare). Once areas with less than one job/hectare were excluded, Ascari found a positive correlation between wages and job densities.

Lewis and Stillman used data from the annual New Zealand Income Survey (1997–2004) and compared hourly earnings, labour productivity, and labour utilisation across regional council areas. Their analysis is based on the assumption that labour is paid its marginal product, which implies that payments to labour are also indicators of productivity. Using a range of earnings measures, they found that Auckland and Wellington have the highest levels of productivity performance in New Zealand and noted that Auckland has

experienced stronger growth in wages.²² An important contribution of this study was to show that earlier work by New Zealand Institute of Economic Research and by the National Bank was incorrect in identifying Auckland as a relatively poor performer in productivity terms.

Maré and Timmins of Motu Economic and Public Policy Research used several data sources and estimated effects over the period 1987–2003. They found that productivity is higher as a result of localisation as theory predicts, but it is *reduced* by urbanisation. Exporting, being a large firm, and having market power in output markets were all correlated with higher productivity. The paper pays very careful attention to the definition and measurement of labour productivity and allows a range of different agglomeration effects to reveal their significance. In particular, it seeks to separate “localisation” and “urbanisation” effects:

- Localisation refers to congregations of similar firms.
- Urbanisation refers to congregations of different firms (i.e. diversity).

Motu cautions that, while its findings provide tentative support for geographically targeted policies to improve productivity, “the effects are neither economically large in aggregate, nor uniform in their impact across different firms and industries.” It is also worth noting that although Motu’s work tried to distinguish localisation from urbanisation, these two effects could work together.

The most recent work by Maré estimated average labour productivity for various parts of Auckland, relative to the rest of New Zealand. It found that productivity per worker is 30% to 50% higher in the Auckland region (than the rest of New Zealand) while the central business district has a premium of 120% to 150%. These ratios are similar to those found between comparable parts of London relative to the rest of the UK. Around half of the premium is attributed to the fact that industries with high labour productivity happen to be located in Auckland (again similar to London). Maré estimates that doubling Auckland’s population density would increase labour productivity by 8.6% (recall from above that the international range is 3% to 8%) but noted aspects of his work that would suggest this is perhaps overstated.

Regarding the policy implications, to our knowledge, there is no local work that involves a serious comparison of the costs and benefits of increasing Auckland’s population density.

3.2 Intra-Auckland Effects

An alternative perspective on the role of agglomeration can be gained by looking at the spatial patterns of living and working in Auckland. To the extent that backward linkages (from firms to input markets) are delivering benefits, we would expect to see a tendency for people to live close to their place of work. We also note that several territorial

22 This is consistent with our analysis in the companion paper (“The Composition and Scale of Auckland’s Economy”), which found that Auckland incomes were 20% higher than national averages.

Part 4. Drivers of Economic Growth in Auckland

Table 4 Shares of territorial authority work location by residence

| live \ work | Rodney | North Shore | Waitakere | Auckland | Manukau | Papakura | Franklin |
|-------------|--------|-------------|-----------|----------|---------|----------|----------|
| Rodney | 59% | 19% | 5% | 16% | 2% | 0% | 0% |
| North Shore | 2% | 63% | 2% | 30% | 3% | 0% | 0% |
| Waitakere | 2% | 6% | 44% | 43% | 4% | 0% | 0% |
| Auckland | 0% | 4% | 4% | 82% | 9% | 1% | 0% |
| Manukau | 0% | 2% | 1% | 36% | 58% | 3% | 1% |
| Papakura | 0% | 1% | 0% | 24% | 31% | 40% | 4% |
| Franklin | 0% | 1% | 0% | 14% | 17% | 9% | 59% |

Source: Statistics New Zealand. Note: Largest shares of cross-territorial authority commuting are coloured blue.

authorities in the Auckland region are seeking to promote patterns of this type through encouragement of combined “live-work-play” developments.

Whether there is such a tendency can be analysed using travel-to-work data from the census. Table 4 shows all of the Auckland region territorial authorities, and the distribution of work locations for the populations in each. In all cases, the largest fractions work in the same territorial authority as their residence. However, this is only just correct for Waitakere City, 43% of whose residents work in Auckland City.

The largest shares of cross-territorial authority commuting are coloured blue in the table. Auckland City attracts significant shares of commuting workers from all other territorial authorities.

3.3 Transport and Land-Use Issues

The above discussion underlines the role of transport infrastructure and services in helping to offset the forces that undermine productivity growth in Auckland (and other cities). This role is widely recognised in the policy community, as is the need for transport decisions to be connected to land-use policies. Nevertheless, significant challenges remain if Auckland is to implement the Regional Growth Strategy, which among other things envisages intensification of housing along transport corridors.

The capacity of Auckland’s transport infrastructure has increased materially in the past few years. A few of the projects completed include work on motorway junction connections near the central business district, the opening of the Northern Busway, and the commissioning of Britomart as the key node in a rejuvenated rail network. These and other projects being run under the Auckland Regional Transport Authority are increasing the accessibility of key business locations in the region.²³

23 <http://www.arta.co.nz/publications-projects/keyprojects.html>

At the same time, the role of agglomeration economies is being recognised in the evaluation of transport projects. For example, a recent summary of work on a new harbour crossing cited agglomeration benefits along with more traditional measures.²⁴

While these initiatives are amenable to sound policy development and implementation, housing issues are rather less so. There are two practical challenges, both economic in nature and arising from the business case for property development, which is required to achieve the intensification along transport corridors envisaged in the Regional Growth Strategy:

- **Existing use.** Where land is already in use, redevelopment forgoes the current revenue stream. This is a temporary interruption, but it needs to be followed by a significantly higher revenue stream post-development if the project is to be considered viable. Redevelopment will therefore generally occur only where there is scope for a significant increase in scale, and will be more likely in places with lower opportunity costs (i.e. lower existing revenue streams).
- **Fragmentation of land holdings.** Larger-scale developments often require larger land parcels. When land holdings in growth corridors are spread across multiple owners it is more difficult to aggregate them to the required degree.

3.4 Urban Form

A pervasive aspect of the existing plans and strategies for Auckland is the desire for a compact urban form. This is generally interpreted to mean a restriction on development outside the metropolitan urban limit.

We have no specific view on the merits of the existing metropolitan urban limit, and note that decisions over any changes to it involve making trade-offs that are complex even at a conceptual level. More generally, the compact urban form policy has a high level of support within local and regional government in Auckland. While we do not dispute that this has some benefits, it also has costs, and to our knowledge there has been no serious attempt to compare the benefits with the costs.

The importance of doing so is underlined by two important policy issues. One is how to simultaneously promote a compact urban form and affordable housing? On the face of it, these two policy goals appear to be in direct conflict. We believe that the supply side of the market is most likely to offer solutions. Measures that subsidise the purchase of housing will tend to increase demand, and prices will follow; the opposite of what is required. It may be possible to link affordable housing policies with corridor intensification to simultaneously address both of these issues. It is not clear whether that would require direct investment of public funds or merely involve local government smoothing the development path.

24 <http://tinyurl.com/6gqbtg>

Land use is a more general issue than housing, however, and it is well known that the availability of business land in and around Auckland is very constrained. Several recent studies have confirmed this, though precise estimates vary. A recent review²⁵ concluded that there will be demand for around 3,000 hectares of vacant business land over the next 25 years, whereas there is at most 1,004 hectares available currently, and possibly as little as 241 hectares.

For any land market to function well, a reasonable level of “headroom” is required. If supply becomes too tightly constrained it will push up prices well beyond where they would otherwise settle. Moreover, if people can reasonably expect periodic times of tightness, they will tend to strategically withhold capacity to provoke the onset of such events. Again, the solution is on the supply side. And again it conflicts to some degree with the desire for a compact urban form.

Decisions over the zoning of land are currently influenced by a combination of territorial authority and regional council policies and plans. There would be merit in coordination between the decision makers to ensure that existing tensions between local and regional land supply needs are managed effectively.

4. Innovation

Innovation is the ultimate source of sustainable increases in per capita incomes. It allows us to produce more value from fewer resources. It is not within the direct control of policy makers, but can be stimulated indirectly through the creation and maintenance of suitable environments (in the broad sense of that term). To achieve this, one must first understand how innovation works.

Before exploring the nature of innovation, it may be helpful to illustrate its importance. From the 1950s, economists had access to good-quality data on the inputs and outputs of the US economy. When they began to compare the output growth with changes in the scale of inputs, it was found that additional inputs could account for only around 15% of the output growth. The remaining 85% was caused by something else. Subsequent work identified the scale of productivity gains attributable to innovations such as the electrification of factories. This illustrates the potential gains available from innovation.

One can helpfully divide innovations into two types: world-changing technological shocks known as “general purpose technologies”; and the much more common incremental changes. Lipsey²⁶ argues that there have been perhaps 25–30 general purpose technologies in the past 10,000 years; they include domestication of plants, the invention of writing, and the invention of the computer.

25 Manukau Business Futures Scoping Report, Phil McDermott Consultants, 2008.

26 Lipsey, Richard, “General Purpose Technologies: Economic Growth and Innovation Policy”, Lecture to the New Zealand Treasury, 2002 (<http://tinyurl.com/6hsdfp>).

4.1 Risks of Innovation

Perhaps the most important aspect of innovation is that it is inherently risky. Rosenberg²⁷ divides the risks into two groups:

- the risk of not creating a new product
- risks remaining even if one succeeds in creating something new.

The first of these risk categories is reasonably obvious: it is in the nature of research that one does not know what will be found. Scientific work of the type to which firms commit their R&D budgets therefore has uncertain chances of creating *any* new knowledge. Even if new scientific ground is broken, however, it may not lead to a marketable product, or do so only at prohibitive cost.

Suppose there is a potentially valuable product created, however. The following risks remain:

- It may be too costly for commercial viability (e.g. the Concorde).

Sometimes it is reasonable to expect declines in production cost with volume or learning, but these are uncertain.

- It may not be sufficiently appropriable.

Innovators need to expect they will get a lead in the market of sufficient value to compensate for development costs. Unless the innovation can be patented, or there are very strong first-mover advantages, there is a risk that rivals will copy the innovation while avoiding the R&D costs.

- It may be vulnerable to official expropriation.

This could occur through regulatory control, changes in legislation, or court decisions in actions brought by rivals.

- It may be superseded by a new innovation.

To quote Rosenberg, “one of the greatest uncertainties confronting new technologies is the invention of still newer technologies.”

In light of this description it is not surprising that most spending on R&D occurs in relatively large firms, and it follows that New Zealand has no natural advantages in this regard.

27 Rosenberg, Nathan, “Innovation and Economic Growth”, OECD, 2004 (available at <http://www.oecd.org/dataoecd/55/49/34267902.pdf>).

4.2 Measurement Issues

Innovation is notoriously difficult to measure.²⁸ The usual approach is to gather information on many different indicators of innovation, such as

- spending on research and development
- patent applications or registrations
- new firm creation
- new product releases.

The European system of innovation measurement has become the default approach. It uses Community Innovation Surveys (CIS), which aggregate many indicators; and is summarised in the so-called “Oslo Manual”. Statistics New Zealand conducted innovation surveys in 2003 and 2005 that were consistent with this, but reported that the definitions change between these two surveys.²⁹ We have not been able to locate any work that directly compares New Zealand with other countries on the basis of these surveys.

4.3 How is New Zealand Placed?

In September 2007, the OECD published a review of innovation policy in New Zealand.³⁰ While strengths were recognised, the OECD concluded that the following issues were the main weaknesses:

- physical and virtual infrastructure
 - transport bottlenecks in Auckland³¹
 - electricity grid issues
 - poor broadband infrastructure
- lack of investment in business R&D
 - only one-third of the OECD average rate
 - small scale of many firms a contributing factor
- barriers to business growth
 - partly due to physical remoteness from export markets
 - also cited were capital market failures

28 <http://tinyurl.com/6s8qxc>, Dubner, Stephen J., “How Can we Measure Innovation? A Freakonomics Forum”, 25 April 2008.

29 <http://tinyurl.com/5wkjen>, “Guide to Interpreting the Data”, Chapter 1 in *Innovation in New Zealand 2005*, Statistics New Zealand, 2007.

30 <http://tinyurl.com/2qmqch>, *OECD Reviews of Innovation Policy: New Zealand*, September 2007.

31 This was asserted but not further developed or supported.

- tax disincentives to overseas expansion
- lack of fiscal incentives for R&D
- barriers to outward direct investment
- lack of management, marketing, and distribution skills
 - cited as a “major impediment”
- poor diffusion processes
 - mismatch between work in Crown research institutes and universities and the needs of the small and medium enterprise sector
- defects in the policy governance of the innovation system
 - inhibits strategic direction of public funds
 - poorly targeted support schemes
- inadequate incentives to public research organisations
 - questioning the value of a *fully* contestable model
- excessive reliance on a few policy principles
 - such as market failure as a hurdle to public spending and funder/provider splits.

These views and others in the OECD report are strongly suggestive of the need for a nuanced and somewhat pragmatic approach to innovation policy. They also clearly point towards a role for public investment, particularly given the relatively small scale of New Zealand firms on average.

While many of the deficiencies cited by the OECD are matters for central government, there are some issues that could be addressed regionally. These include

- physical and virtual infrastructure, and possibly
- assisting the diffusion process by helping small and medium enterprises interact with the research community.

4.3.1 Incubation and science/business parks

Three of the seven business incubators supported by New Zealand Trade and Enterprise are located in the Auckland region. Incubators are used to develop businesses from a very preliminary stage. They are operated by the University of Auckland, Massey University, and Auckland University of Technology. Each appears to have had some success in developing profitable firms.

For more established firms, a science or business park is more appropriate than an incubator. Internationally, these parks range widely in size, with some Asian examples being among the largest in the world. A significant advantage of business park location is the potential for “happy accidents” to occur as entrepreneurs find others working on

complementary developments, with whom collaboration is potentially profitable. This can lead to clustering of the type that Motu found to increase productivity (see section 3). There are currently no science or business parks of this type in Auckland, although the Government and Auckland City Council have recently announced funding for a New Zealand Innovation Centre at Auckland University's Tamaki Campus. It will create a cluster of companies and support organisations that will foster growth of high-tech research and development companies.

4.4 Attracting Innovators

It will be apparent that most of the weaknesses identified by the OECD are out of the control of local government. However, Rosenberg's list of risks suggests that innovators have quite specific personality types. The BBC's Science and Nature section describes their characteristics:

- They are energetic and creative, taking inspiration from everyone they meet.
- They enjoy flexible work environments with few rules and many opportunities for fun.
- They think of themselves as imaginative, sociable, and sympathetic.
- They may not think logically about their ideas.

The first of these points links to the work of Richard Florida,³² who argues that locations that are home to large numbers of artists, musicians, and gays are also home to high-tech workers and are generally economically better off than other places. There is certainly debate about the empirical strength of Florida's arguments. For example, it may be that artists congregate in wealthy locations because that is where they find patronage, in which case the wealth "comes first". However, it is equally clear that innovators need to be creative, and plausible that they would want to live near other creative people.

These observations complement the OECD task list, because whatever the outcome of R&D, innovators are still needed to bring ideas to market. Moreover, they point more clearly to roles for local government in

- making the area physically attractive
- fostering social and cultural activities
- reducing compliance costs for residents and businesses.

Some places have been able to transform their economies with the help of immigrant innovators. Israel is a very good example. Nordfors and Shalit³³ report that 26 incubators

32 http://en.wikipedia.org/wiki/Richard_Florida. Florida's books include *The Rise of the Creative Class*, *Cities and the Creative Class*, *The Flight of the Creative Class*, and *Who's Your City?*

33 Nordfors, D. and Shalit, O., "Technological incubators in Israel -Immigrants start up Hi-Tech companies", 1998 (<http://www.nordfors.com/incubators/statteng.htm>).

were established during the early 1990s when Israel received large flows of immigrants from the Soviet Union. They claim,

55% of the innovators accepted by the incubators succeed in developing a product prototype and creating a company which develops, often through the participation of external investors. Results achieved are impressive, particularly as they often involve the transformation of immigrants from the former Soviet Union block - many innovators have never before been exposed to a market economy - into running their own businesses in Hi-Tech industries.

The successes achieved can be attributed to a number of explanatory factors - a judicious balance between the rules of the incubation process, a well-functioning culture built up around the programme, strong personal motivation on the part of new immigrant entrepreneurs, a risk capital market with a willingness to invest in addition to a number of other factors.

This illustrates the feasibility of importing innovators. The report also shows that the process of converting immigrants to innovators and then to entrepreneurs has some very specific design features. For the incubators themselves, these include

- close connections with a university or other research group
- direct involvement with industry, which perceives long-term financial gain
- annual grants from the State to cover administration and accommodation.

One of the criteria for a product idea to be accepted by the Israeli incubators is that it should be not only commercially viable but also a product that can be made in Israel and exported.

These features appear readily transferable to Auckland. In addition, the ingenuity for which New Zealanders have traditionally been well regarded suggests that there is already a reasonably deep pool of potential entrepreneurs in Auckland.

5. Potential Drivers of Growth in Auckland

In this section, we draw on the above analysis and our earlier work (“The Composition and Scale of Auckland’s Economy”) to identify specific issues that could start a new and stronger cycle of economic growth in Auckland. The focus is on matters that are amenable to public policy influence.

5.1 National and Regional Policy Coordination

Across a wide range of indicators Auckland is very different from all other regions of New Zealand. As a result, central government policies designed for New Zealand as a whole will not be optimised for Auckland. This implies a need for “Auckland” to

- be clear about its public policy desires on all matters that are relevant to economic growth
- communicate these effectively to central government.

Policy coordination need not imply a single policy stance for New Zealand, but slanted towards the needs of Auckland. Instead, it could be possible to allow Auckland some flexibility, either through a devolution of authority or by accommodating Auckland’s needs within a broader national policy.

5.2 Specific Policy Areas

There are three areas in which regional government policy could contribute to higher rates of economic growth:

- labour markets
- the built environment
- innovation networks.

5.2.1 Labour markets

Labour markets have not traditionally received much attention from regional government. However, they are very important for growth, and particularly so in Auckland. There are two main reasons. First, Auckland’s population is extremely diverse in background, and becoming more so. Second, personal and household incomes are the most reliable indicator of economic well-being in the region. It is therefore critical that Auckland’s population is skilled in ways that will be needed by industries to grow.

There are significant time lags involved in education and training, so that areas of demand when a person begins training may not exist to the same extent once they have completed training. Forecasting the labour skill needs of industry is therefore difficult, but very important.

5.2.2 The built environment

There is at least a perception that aspects of Auckland’s energy, communications, and transport infrastructure are unsatisfactory. While this persists, it will deter business investment in Auckland to some extent. While the literature cautions that infrastructure investment does not necessarily deliver good social returns, such returns are much more likely when there is a clear need for catch-up spending.

A continuation of the recent upswing in transport infrastructure in Auckland appears warranted. Energy networks are a source of ongoing concern. And faster and more widely available broadband is clearly desired. In addition to serving existing business in Auckland, attention to these issues will make the region a more attractive location for talented workers.

Special mention should be made of the sea port, which occupies perhaps the most valuable real estate in Auckland. We know of no serious examination, from a social standpoint, of the merits of relocating the container terminal to Tauranga or Marsden Point. This would have ramifications beyond the Auckland region, but the benefits of alternative uses for the site would appear to be significant, and would largely accrue to Auckland.

5.2.3 *Innovation networks*

Local and regional governments in other countries have made significant efforts to stimulate innovation.³⁴ Often they did so as a reaction to industrial decline and accompanying job losses, rather than as a way of building on an already reasonable foundation as is the task facing Auckland.

Expenditure of this type is difficult to justify on cost-benefit terms because the benefits are so uncertain. However, the lesson from microeconomic economic growth (section 2.4) is that by starting with small experimental networks of innovators, it may be possible to get good results without major capital risks. This would require tapping into existing entrepreneurial networks, such as the KEA network,³⁵ and actively seeking ways to attract innovative business to Auckland.

34 The Manchester Science Park is a good example (<http://www.mspl.co.uk/>).

35 <http://www.keanewzealand.com/index.html>