

Manufacturing in Auckland City – Economic powerhouse or historical burden?



Client Economic Development Team, Auckland City

Report by Ascari Partners Ltd
PO Box 5345
Wellesley Street
Auckland

Phone +64 9 3580069

Fax +64 9 3580066

Authors Preston Davies
David Waite

Date July 2008

Version Final

Table of Contents

Executive Summary	1
1 Introduction	3
1.1 Purpose	3
1.2 Defining Manufacturing	3
1.3 Scope	3
1.4 Report Structure	3
2 Policy Context	5
2.1 Aspirations for Auckland	5
2.1.1 Economic Transformation (ETA)	5
2.1.2 Auckland Regional Economic Development Strategy (AREDS)	5
2.1.3 Metro Project	5
2.1.4 Auckland City Positions	5
3 Economic Snapshot of Manufacturing	6
3.1 A sector in decline?	6
3.1.1 Value added (GDP)	7
3.1.2 Employment	11
3.1.3 Innovation	12
3.1.4 Other aspects	17
3.2 Summary	21
4 Trends in Manufacturing	22
4.1 Historical	22
4.2 Current	22
4.2.1 Concerns related to “Hollowing Out”	22
4.2.2 Linking Innovation and Manufacturing	23
4.2.3 Linkages with the Service Sector	24
4.2.4 Positioning in Australasian Cities	24
5 Perspectives from the Agglomeration Literature	28
5.1 What is Agglomeration?	28
5.1.1 Form of Agglomeration	28
5.1.2 Industry Maturity	29
5.1.3 Functional Specialisations and Intra-Firm Separation	29
5.1.4 Home Market Effects	29
6 Ways to think about Manufacturing in Auckland city	31
6.1.1 Intervention logic	31
6.1.2 What is creative destruction?	33
6.1.3 How do we assess whether creative destruction is happening?	33
6.1.4 Available levers	35
6.1.5 Optimality	36
6.2 Summary	37

7	Future Scenarios	38
7.1	Exit, Steady-State or Acceleration	38
7.1.1	Exit	38
7.1.2	Steady-State	39
7.1.3	Acceleration	39
8	Concluding Remarks	41
	References	43

Executive Summary

The purpose of this report is to provide Auckland City Council with a set of principles and criteria by which to understand and consider manufacturing's current and future roles within Auckland city. This research is to inform work being undertaken on the District Plan review. It is a preliminary undertaking that must be developed with further research in order to arrive at robust policy positions.

Manufacturing's significance within the Auckland economy is a key finding of this report. Its importance stands independent of its size, and its historical position as a mainstay of the Auckland economy. In this respect, manufacturing shows high employment, high output, strong rates of R&D and innovation, as well as connectedness to both overseas markets (where pressures to innovate often stem), and with other sectors in the Auckland economy. These factors are central to productivity growth.

Manufacturing is complex to analyse. The analysis in this paper is largely based on national and regional level data, as well as data obtained at the sectoral level. This has its limitations, leaving many of the conclusions for Auckland city to be inferred from what is occurring at wider scales. Auckland's city's large share of manufacturing activity, however, suggests that the application of regional and national trends is not inappropriate.

However, analysis at a high-level, means it is easy to miss crucial shifts occurring at lower, sub-sectoral levels. As a hypothetical example, Auckland's competitiveness may be markedly advanced in chemical manufacturing where shifts from low value to high value added activity occur through increasing R&D investment. This points to the fact that a wide range of processes and activities take place within manufacturing - reflecting different industrial structures, positionalities on global value chains, productivity drivers and end markets. These trends need to be examined through more detailed research at the firm or sub sector level.

Auckland isn't alone in questioning the role of manufacturing in cities. The trends that we observe in Auckland, are also being experienced overseas. In this case, business services are increasingly regarded as central to competitiveness and growth, while, in the overall picture, manufacturing is trending downwards. State governments in our Australian counterparts (Sydney, Brisbane and Melbourne) have identified a continuing role for manufacturing in their cities and are focussing on attracting high value added manufacturing activities.

Overseas evidence also shows that manufacturing is moving to the edge of urban areas. This is perhaps *prima facie* evidence of the impact of land prices in central city areas. This also raises a key point in the context of manufacturing's future in Auckland city: the impact of manufacturing's exit from Auckland city to the Auckland region will be very different from its exit out of the Auckland region altogether. Considerable benefit may still be derived from linkages between manufacturing elsewhere in the region and services provided by businesses within Auckland city.

Although providing no direct policy levers, agglomeration theory provides key explanations for the concentration of manufacturing activity in cities. Here localisation or urbanisation economies, industry maturity (relative to city size), and home market effects may be determinative.

It is important to consider the role of local government and why it should play a role in manufacturing activity. Government intervention is usually warranted if there is a market failure or if inefficiencies are present which the intervention can improve. Caution must be exercised when considering interventions, as government failure may occur just as readily, if not more so, than market failure. The key question therefore, is will the government intervention do more good than harm?

Initial investigations conducted in the paper reveal that there are no major market failures, and that markets appear to be doing their job. There is *prima facie* evidence of dynamism and reallocation within the sector within Auckland city, consistent with notions of creative destruction. Such a process is key to improved sector competitiveness. Given this, our key conclusion is that there is no evidence to show that action from Auckland City Council, through district plan interventions, will be efficiency enhancing. That is not to suggest that Auckland City Council should do nothing, but rather some caution should be exercised in looking to do more. Intervention, either to slow the rate of decline apparent in the sector in Auckland city, or to hasten that decline, would appear to result in inefficiency costs that would likely outweigh any “benefit” from such action.

As alluded to above, further research will be needed at a lower level to develop a better understanding of possible futures for manufacturing in Auckland. This will need to 1) be focused at the firm level, 2) investigate the nature and extent of connections to other sectors, and 3) consider what will replace manufacturing if it does exit? Additionally, research could usefully address: the strength of path dependencies or lock ins (contractual lags may conceal underlying price pressures, for instance); whether manufacturing is good for Auckland city’s rating base (the financial/fiscal perspectives); as well as potential roles for the AIC to help spur manufacturing.

1 Introduction

1.1 Purpose

Auckland City Council (the Council) is undertaking research on the manufacturing sector in Auckland city. One of the objectives for the research is to identify the extent to which manufacturing activity should be retained in Auckland city to support a diverse economy and job opportunities. The purpose of this report is to outline a set of economic principles and criteria, which can then be inputted into a decision-making framework that would assist in considering the future role of manufacturing in Auckland city. It is but one of a number of inputs, and, given the wide ranging perspectives and high level of information needed to be definitive, this report merely provides guidance for decision-makers, rather than being decision-focused itself.

1.2 Defining Manufacturing

The Statistics NZ definition of Manufacturing is as follows:

“Manufacturing includes units mainly engaged in the physical or chemical transformation of materials, substances or components into new products (except agriculture and construction). The materials, substances or components transformed by units [under this classification] are raw materials that are products of agriculture, forestry, fishing and mining, or products of other manufacturing units”¹.

However, the High Level Group on Manufacturing in Ireland (2008), have endeavoured to extend conceptions of manufacturing from simply the transformation of raw materials into finished products, to include other areas such as after sales services and logistical operations of the value chain. In other words: “the modern manufacturing process encompasses a broad cycle of activities from research and development through design, production, logistics and distribution to after sales service”.

The group notes moreover that “production” and “manufacturing” are not synonymous. In this regard:

“Production is only one activity of a manufacturing company, and it may or may not be the defining element of the company... manufacturing companies add high value through a range of activities and functions. Production process themselves will become increasingly complex, enabled by advances in technology, quality control, best practice models and enhanced skills” (High Level Group on Manufacturing in Ireland, 2008).

In writing this paper, we have taken into account these wider perspectives.

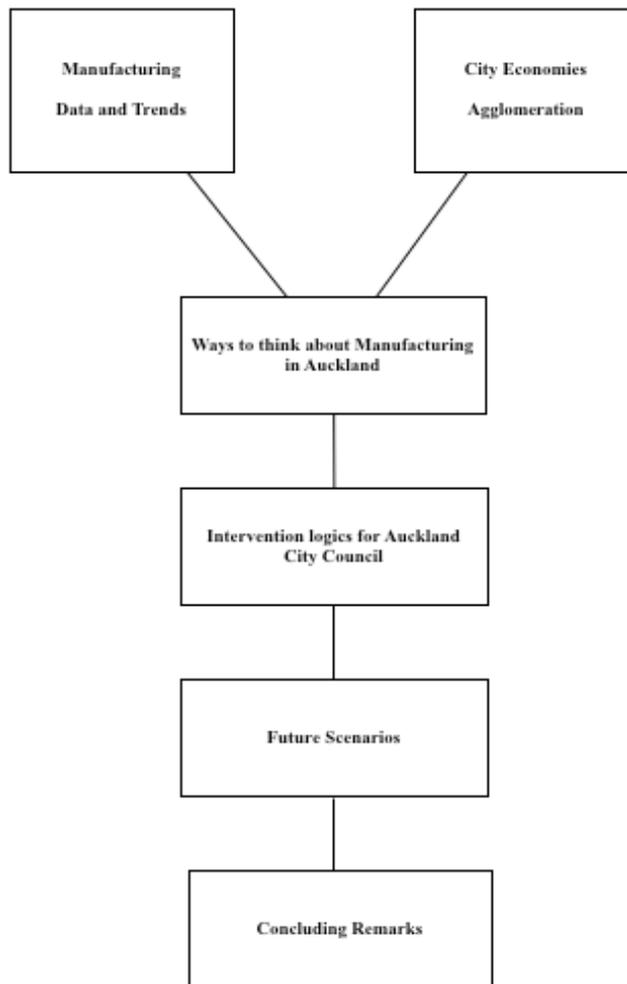
1.3 Scope

This report is based on a desktop study, drawing on both qualitative and quantitative knowledge. Quantitative knowledge is used primarily to set out the current-state of manufacturing. Qualitative knowledge is based in the policy and academic literatures, and is used to draw interpretations and future scenarios for manufacturing.

1.4 Report Structure

The report is ordered according to the following organising framework:

¹ Statistics New Zealand ANZSIC classification



Section 2 proceeds with an outline of the major policy initiatives that inevitably shape the examination of sectors within Auckland. Section 3 then provides a snapshot of manufacturing in Auckland at present, discussing current rates of GDP, employment and innovation. A short discussion of key trends facing manufacturing, such as hollowing out, is given in Section 4. Section 5 notes insights from the agglomeration literature, in order to provide an explanation for the concentration of manufacturing activity within urban areas. An outline of key economic criteria and principles to assess manufacturing's performance, as well as possible logics for local government intervention are laid out in Section 6. Finally, Section 7 raises possible scenarios related to the future of manufacturing in Auckland city, before some concluding remarks are made in Section 8.

2 Policy Context

The need to survey and assess the prospects for manufacturing in Auckland city is couched within a range of policy statements that aim to elevate Auckland's position in key global value chains. In this section, such policy settings are briefly outlined.

2.1 Aspirations for Auckland

Aspirations for Auckland's economic development are outlined in national, regional and local government policies. A consistent feature of these, is the urgency around improving Auckland's competitiveness, as well as its share of high-value, knowledge-based activities.

2.1.1 Economic Transformation (ETA)

The Ministry of Economic Development's *Economic Transformation Agenda* (ETA) is comprised of five major policy platforms. One of these is: "An Internationally Competitive City - Auckland". The supporting narrative for this policy talks about "becoming a world-class city" and "becoming the home of globally competitive firms ([where] uncompetitive industries will vanish)". Of interest to this study is the latter - does manufacturing sit within those industries or sectors that are uncompetitive?

2.1.2 Auckland Regional Economic Development Strategy (AREDS)

As with the ETA, the *Auckland Regional Economic Development Strategy* (AREDS), is the product of an underlying desire to raise the performance of Auckland's economy by concentrating high-value activities within the region, and within centres promoted by the Regional Growth Strategy (RGS) and the more recent centres classification work.

AREDS has the following vision: "Auckland is an internationally competitive, inclusive and dynamic economy; a great place to live and conduct business; and a place buzzing with innovation, where skilled people work in world-class enterprises". Again, the role of manufacturing in helping to achieve this vision is unclear.

2.1.3 Metro Project

In order to achieve AREDS' vision, the *Metro Project* lists key actions that will critically underpin Auckland's economic development going forward. Released in mid-late 2006, the Metro Project Action Plan contains thirty-one actions that support the following objectives:

- Take effective and efficient action to transform Auckland's economy.
- Develop world-class infrastructure and world-class urban centres.
- Transform Auckland into a world-class destination.
- Develop a skilled and responsive labour force.
- Increase Auckland's business innovation and export strength.

2.1.4 Auckland City Positions

Auckland City is soon to release its Economic Development Strategy. The draft strategy focuses on attracting competitive, high value added activities, in line with regional directives.

3 Economic Snapshot of Manufacturing

This section provides an overview for the rest of the paper. Due to data constraints associated with the aggregated level of ANZSIC data, our analysis is at a higher level than what would otherwise be optimal. By this we mean that we are left to infer many things from available data, to the Auckland city level. Despite this, we believe that the analysis is useful, as the nature of manufacturing activity is such that considering smaller or more localised issues in isolation of wider linkages is not helpful.

The purpose of this section therefore, is to establish the dimensions (economic and other) across which it is useful to think about manufacturing. The viewpoint is very much deductive- of manufacturing as an industry, rather than particular characteristics of manufacturing in Auckland city. We first present some data covering key metrics, in order to evaluate the hypothesis of manufacturing as a sector in decline. From there, we introduce a framework to organise thinking on the issue from the perspective of Auckland City Council officers.

3.1 A sector in decline?

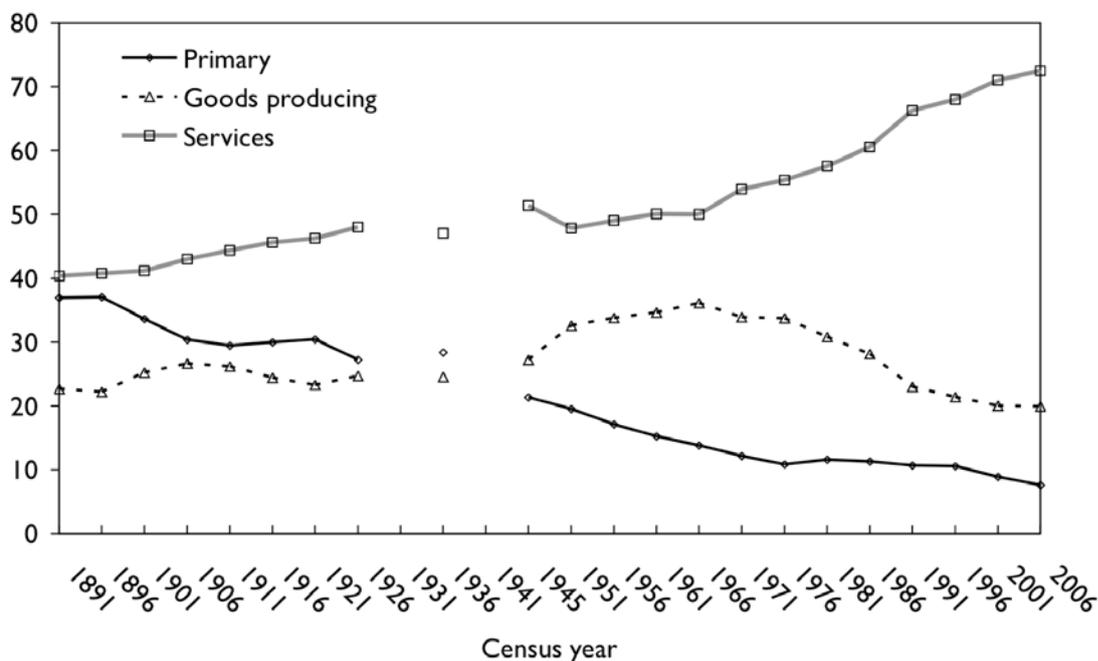
Economies are traditionally segregated into three broad categories: primary, goods producing and services. One feature implicit in moves toward a knowledge-based economy is a reorientation away from the primary and goods producing sectors, towards services. In addition, within the goods producing category, there is further drive to move to more specialised, perhaps niche, manufacturing and higher knowledge-based markets.

Figure 1 provides a long-term view of employment by broad sector in New Zealand. The most notable features are the rise in the importance of services from around the mid-1970s and the relatively steady employment decline of the primary sector. Manufacturing experienced only a slight dip in its relative share of total employment between 1891 and 2006, but exhibits more cyclicity than the other sectors. The late 1970's and early 1980's period was the start of a decline for manufacturing, although that has smoothed somewhat more recently.

One possible (and simple) explanation for both manufacturing and primary experiencing decline is technological change. Much technological change is labour saving in nature and it is conceivable that such change would affect manufacturing and primary workers more than it might affect services workers. To the extent that such change continues, we might reasonably expect similar patterns of job reallocation in the future. However, an alternative view is that the apparent relative decline of manufacturing is somewhat artificial. For much of the period under study, manufacturing (and the agricultural component of the primary sector) was the recipient of significant industry protection, enacted by governments. The reform of this whole system of industry protection began in the mid 1970s and was beginning to accelerate in the early 1980s.² Thus, the apparent steep decline around this period was from a protected basis. Corresponding levels may have been more natural and may indeed signal something of a steady state in terms of a developed countries share of employment accounted for by manufacturing activity. Whatever the reason, it is clear that the services sector is a far more important source of employment than ever before, while the trend for manufacturing is downward.

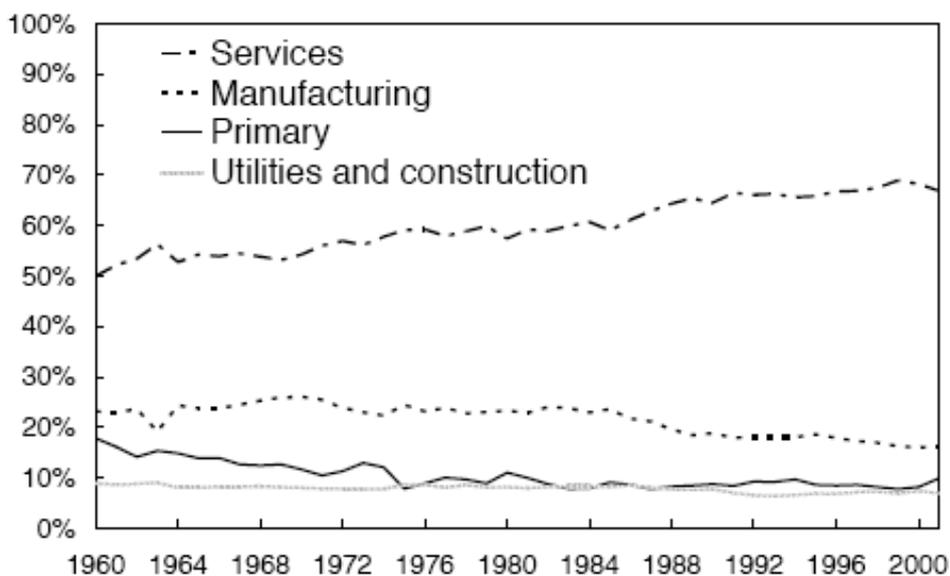
² See Lattimore (2003)

Figure 1 National employment shares by broad grouping



Source: NZIER, Statistics New Zealand (Census), Author's calculations.

Figure 1a Nominal GDP shares by broad grouping



Source:

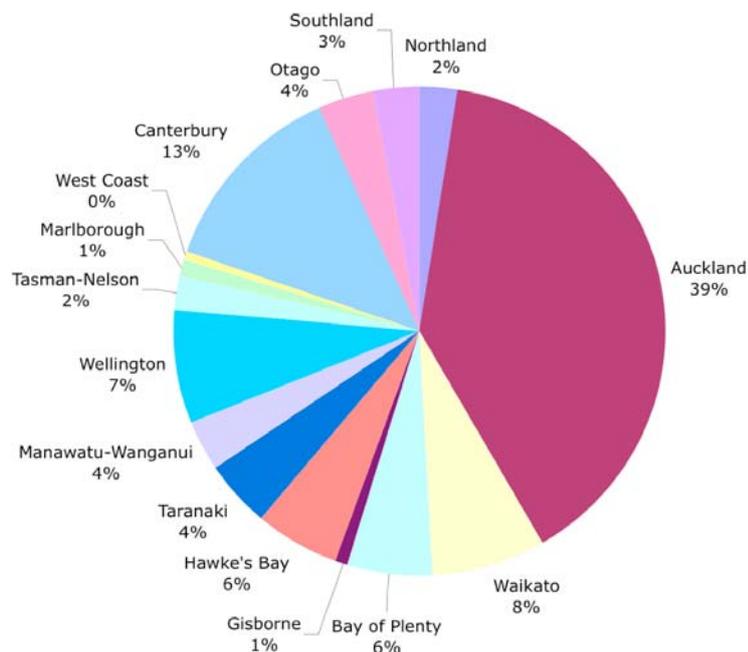
NZIER, Statistics New Zealand

3.1.1 Value added (GDP)

The latest official estimates (2003) show that the Auckland Region is responsible for 39% of the total manufacturing activity (as measured by GDP) in New Zealand. This is three times greater than the second biggest area of activity, Canterbury (see Figure 2). Therefore, over half of total manufacturing GDP is produced in two regions. Interestingly, in terms of employment, the Auckland Region is responsible for only 35% of total manufacturing employment. This is consistent with notions of

revealed comparative advantage for manufacturing activities in Auckland, i.e. value added per manufacturing worker in Auckland is higher than value added per manufacturing worker elsewhere.

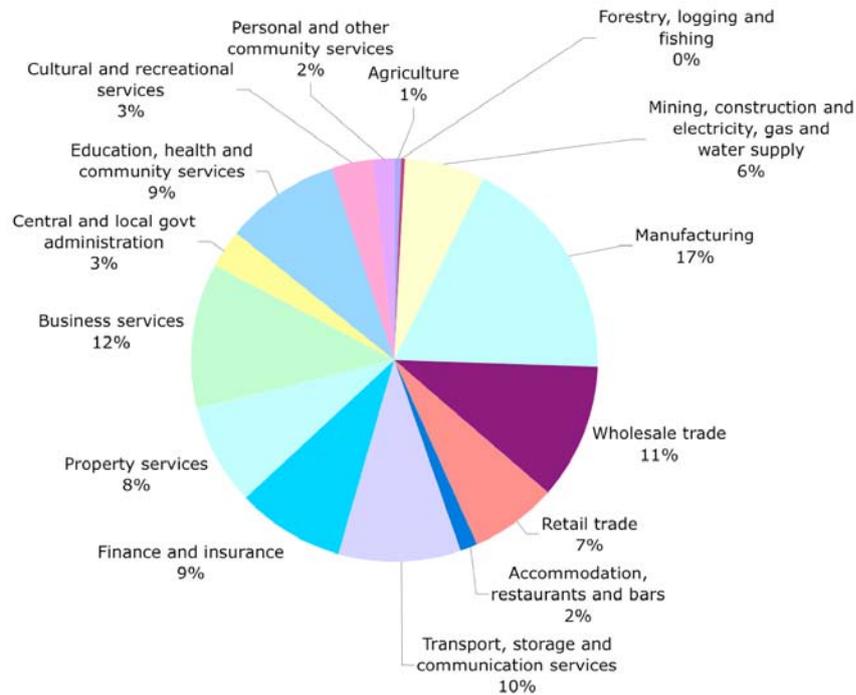
Figure 2 National manufacturing value added by region, 2003



While up to date data is not readily available, it is clear from the available data that manufacturing remains a large part of the Auckland regional economy.³ Manufacturing is far and away the biggest contributor to industry GDP within the Auckland Region (see Figure 3).

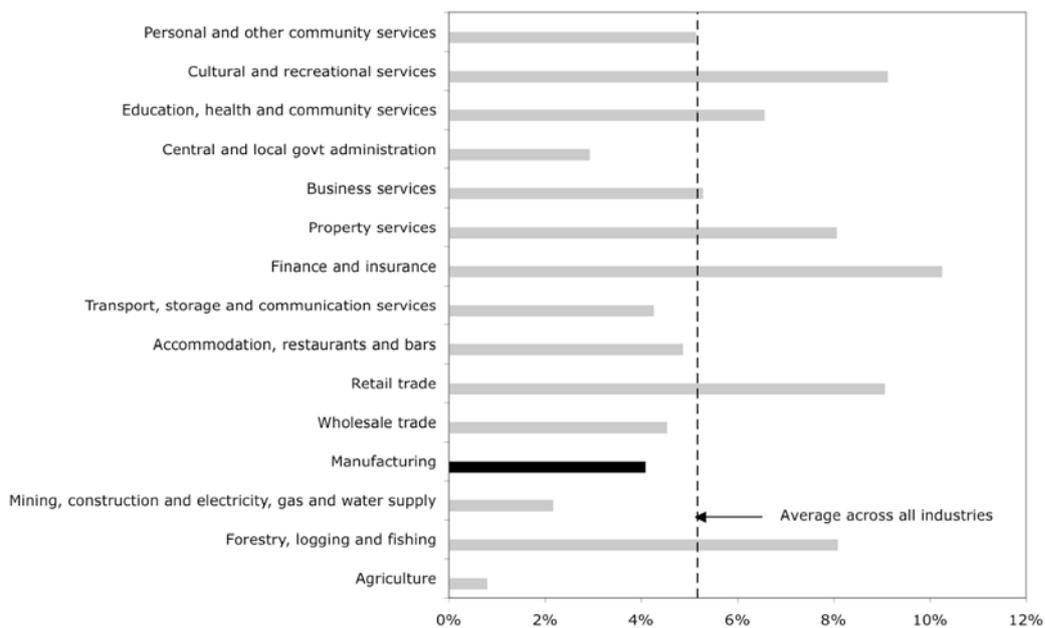
³ This data refers to the period 2000-2003, the last officially produced Regional GDP statistics.

Figure 3 Auckland industry GDP, 2003



Looking at growth in GDP, Figure 4 shows us that that manufacturing has grown more slowly than average industry growth in Auckland in the period under study. The average annual percentage change for manufacturing is around half the change experienced by the “high flying” (largely services related) sectors.

Figure 4 Industry GDP average annual percentage changes, Auckland, 2000-2003



Putting growth and size together, we are able to assess whether being a large sector (in terms of value-added) constrains a sector to lower growth (i.e. size matters for growth). Figure 5 shows that, to a certain degree that might be the case. The four industries (Manufacturing, Business services, Wholesale trade and Transport, storage and communication) with the highest average GDP figures (for the 2000-2003 period) also had below average growth in the period. However, three industries (Finance and insurance, Education, health and community services, and Property services) also had GDP totals that were above average, and grew faster than average as well.

Figure 5 Industry growth rates and initial GDP, Auckland Region, 2000-2003

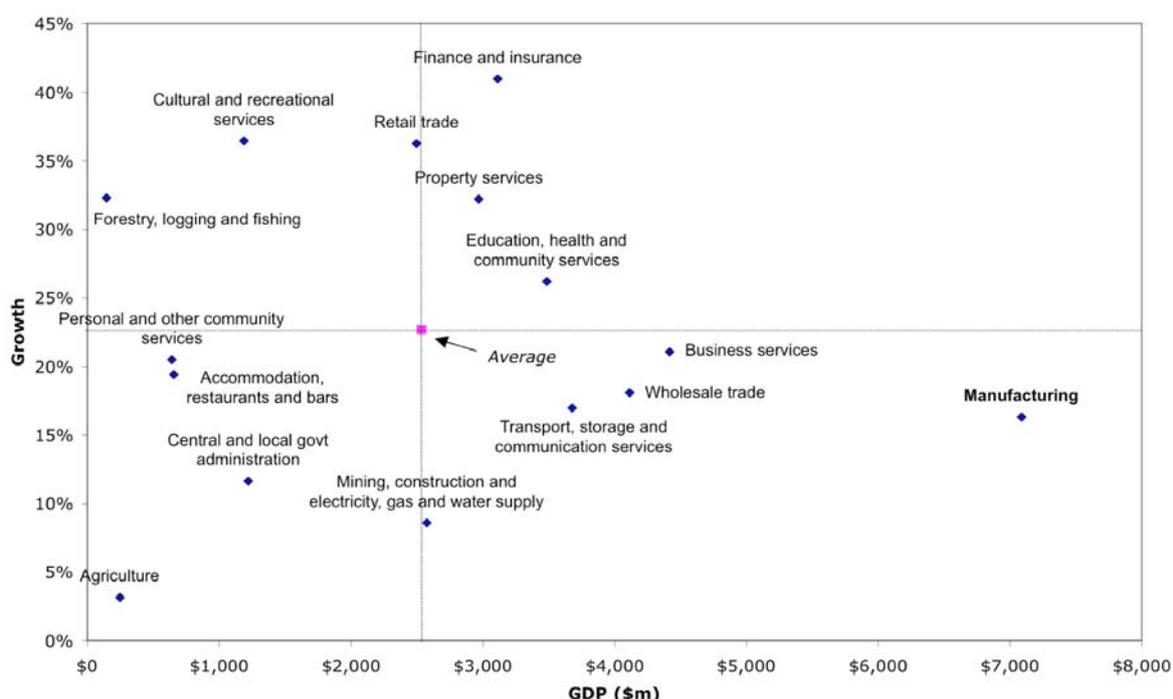
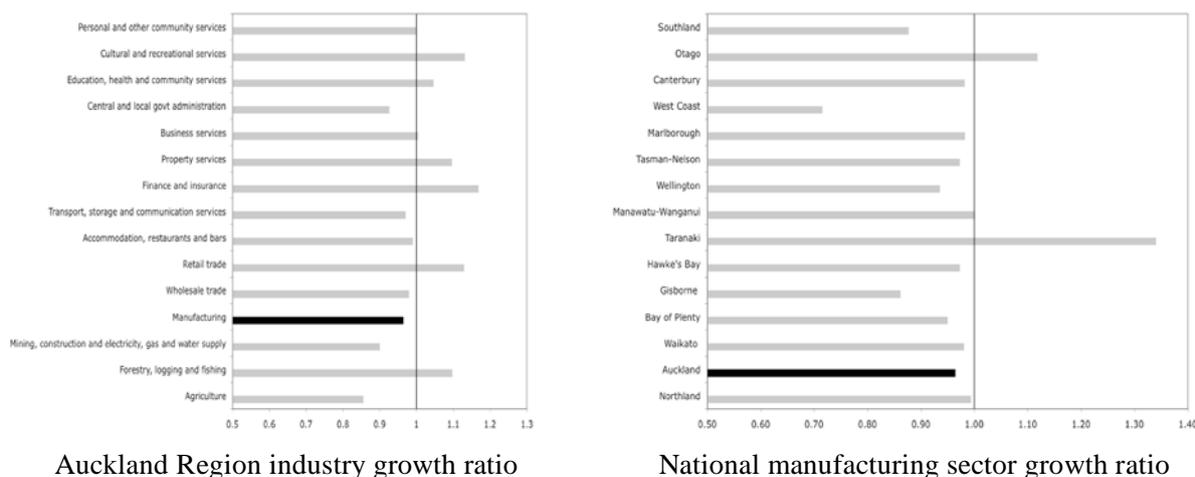


Figure 6 illustrates the somewhat sluggish growth performance of manufacturing as a whole, from the perspective of its share of GDP. The first panel relates specifically to the Auckland region. It shows the ratio of the percentage of industry GDP accounted for by manufacturing in 2000 to the percentage in 2003. Thus, a value above (below) one indicates an increase (decrease) in the relative contribution to Regional GDP of a sector over the period under study. A value of one indicates that the sector has maintained its relative importance over time. Manufacturing has declined in terms of its relative contribution to the Auckland regional economy (GDP) over the period 2000-2003, while other sectors (largely services related) became more prominent.

The second panel looks at whether Auckland is peculiar in experiencing this relative decline. Looking solely at manufacturing GDP on a regional basis, we see that all regions except Taranaki and Otago experienced a similar decline in relative importance of manufacturing to their economies, the most pronounced shifts being in Southland, West Coast and Gisborne respectively.

Figure 6 Changes in share of economy



3.1.2 Employment

A detailed assessment of employment changes for manufacturing by Auckland City Council has been undertaken in tandem with this paper. Therefore, we present only a glimpse of the relevant data here. By and large, manufacturing employment in Auckland city has declined in the recent past. Between 2001 and 2007, 2050 manufacturing jobs were shed in Auckland city, representing a contraction of -0.95% annually in the period. A similar annual contraction of -1% (representing 183 businesses) was also evident in respect of the number of manufacturing businesses in the city.

As would be expected there is considerable variation within the sector. Textile, clothing footwear and leather manufacturing experienced the greatest proportional decline in employee numbers (-3.47% annually) while at the other end of the spectrum, the food, beverage and tobacco sub-sector experienced annual growth of 4.26% annually. While it has been recognised elsewhere that Auckland region is relatively under-represented in terms of manufacturing activity associated with primary industries, these employment figures show that Auckland city has participated in the long period of economic prosperity in the recent past. Employment in areas that manufacture items that may be classed as luxury in nature, such as confectionery, and cake, pastry and biscuit manufacturing have led the way over the 2001-2007 period. The number of businesses in the general food, beverage and tobacco sector has also increased markedly (3.71%). Given the rate of growth of businesses is below that of the rate of growth of employees, this suggests some degree of firm concentration taking place. Given growth has been most acute in the last two years of the data, an interesting question is the extent to which it may reflect external demands as opposed to those onshore.

One other issue of note is that Auckland city has less reliance on manufacturing employment (and number of businesses) than other territorial authorities in the wider Region. It is not clear that this was always the case, but we can hypothesise that relative land prices (related to land availability) have resulted in shifts to areas such as Waitakere and Manukau with cheaper land. With changes to transport costs and options (i.e. bigger trucks and better roading networks), access to ports, airports and markets would have increased, lessening the need for proximity. There is some evidence that manufacturing firms have even shifted as far as other towns in the upper North Island such as Paeroa, Ngatea and parts of Hamilton, where land is abundant (and consequently cheaper than in Auckland). As mentioned in relation to firm concentration above, further work on firm location would be very helpful in getting around some of the limitations inherent in the data.

3.1.3 Innovation

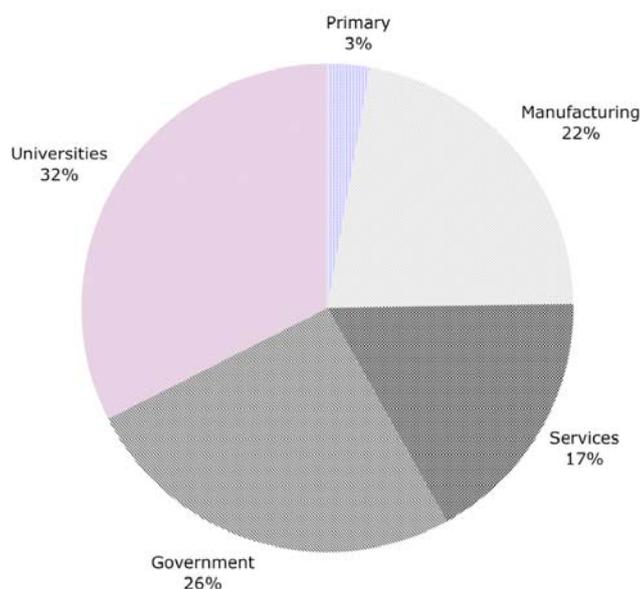
Increasingly, innovation is recognised as being the primary driver behind productivity performance. The ability to develop and apply new technologies will continue to separate top performers from laggards. To that end, we are interested in the extent to which the manufacturing sector is participating in the regional innovation system or undertaking activities under the broad rubric of innovation. Unfortunately, data at lower levels is not readily available and we therefore can only examine this issue from the national perspective.

Figure 7 shows the percentage of total research and development (R&D) expenditure by sector, in 2006. Manufacturing is a significant contributor to total R&D expenditure. In some respects the boundaries between the respective categories are artificial with respect to the sector that benefits from the R&D activity. We would expect that there would be some overlap between the R&D activities undertaken in the Universities and Government sectors (and to a degree the Primary sector) would feed through to manufacturing in some way. The data we have, however, relates to the sector where expenditure occurs.

In terms of growth, the available numbers suggest that the manufacturing sector is aware of the opportunities that may arise from R&D expenditure and how important it is for the sector to remain competitive. Figure 8 indicates that between 2004 and 2006, expenditure by the manufacturing sector rose by almost 20%. This is a similar rate of growth as that for the services sector, which was coming from a lower relative base. Hence, considerable sums of money (in absolute terms) are involved.

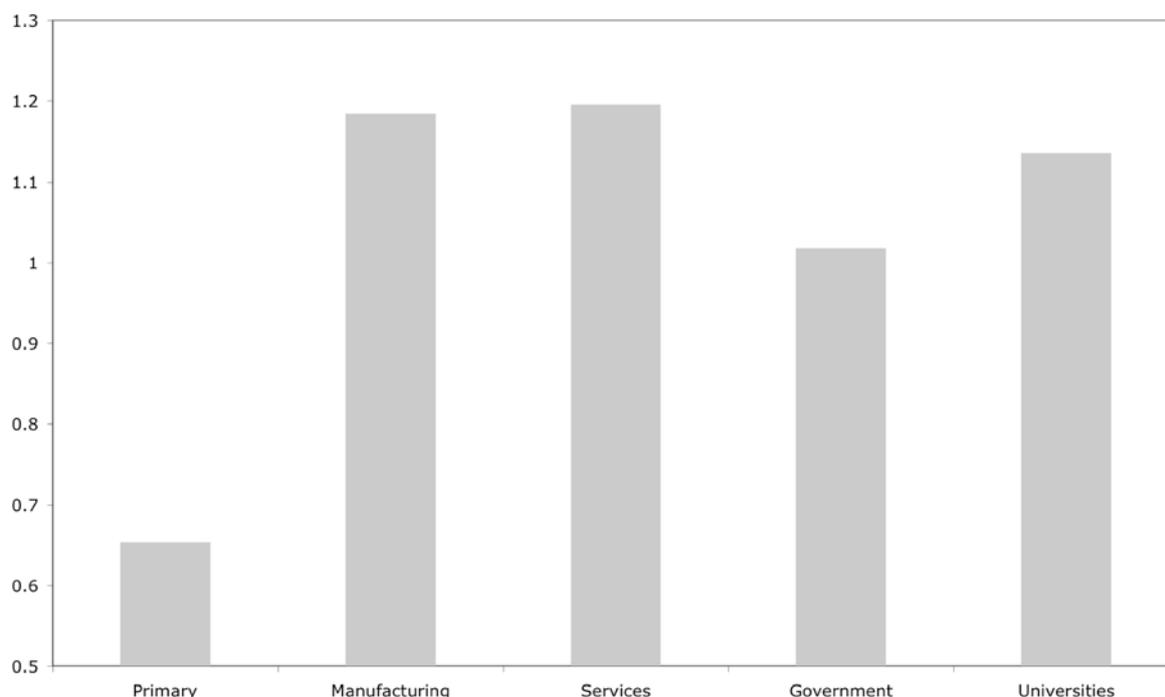
The total spend on R&D by the manufacturing sector is broken up into sub-sector components in Table 1. There is considerable variation within manufacturing. We see that those sub-sectors with larger expenditure shares tended to exhibit lower growth rates than those coming off a low base.

Figure 7 R&D expenditure by sector/industry, 2006



Source: Statistics New Zealand Research and Development Survey, 2006

Figure 8 Growth in R&D expenditure, 2004-2006 (Ratio of expenditure in 2004 to expenditure in 2006)



Source: Statistics New Zealand Research and Development Survey, 2006

Table 1 Manufacturing sub-sector R&D spend

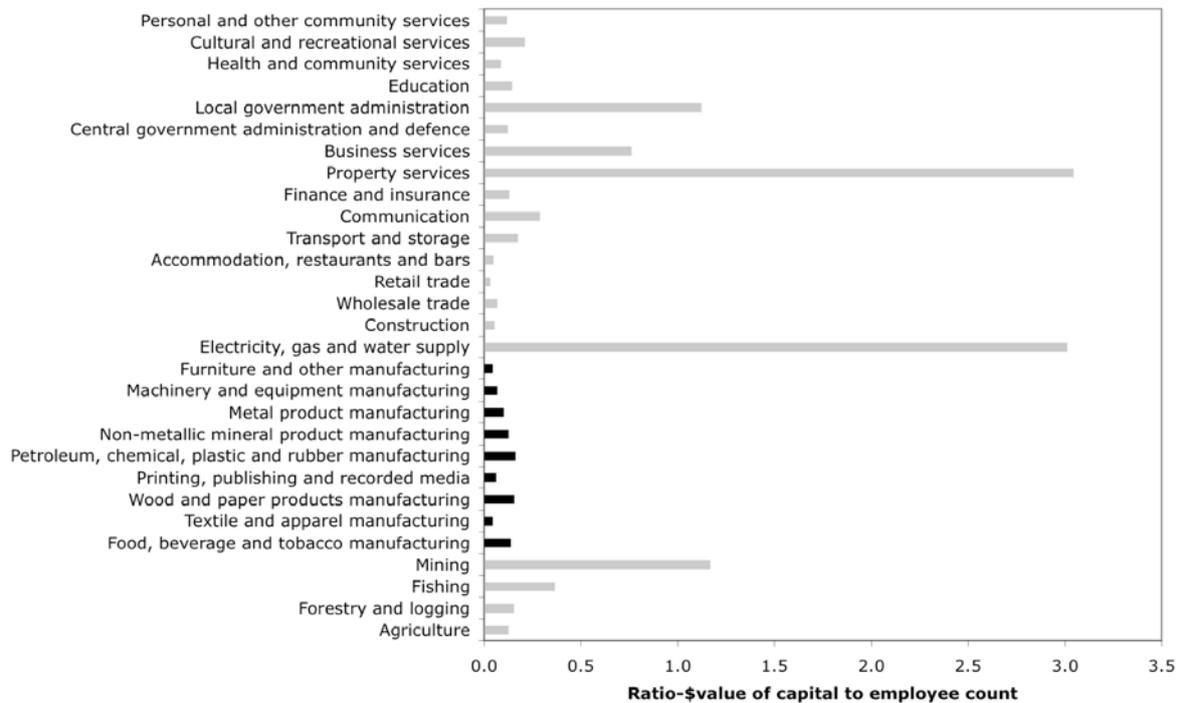
	2004 (\$ m)	2006 (\$ m)	Change (\$ m)	Change (%)
Food, beverage and tobacco manufacturing	81.0	94.0	13.0	16.1
Textiles, clothing, footwear and leather manufacturing	6.6	25.9	19.3	292.8
Petroleum, coal, chemical and associated product manufacturing	65.1	79.9	14.8	22.8
Non-metallic mineral product manufacturing	3.7	3.3	-0.4	-10.9
Metal product manufacturing	21.9	16.2	-5.7	-26.1
Machinery and equipment manufacturing	148.0	166.7	18.7	12.6
Other manufacturing	9.6	11.9	2.3	24.7
Total	335.9	397.9	62.0	18.5

Source: Statistics New Zealand Research and Development Survey, 2006

Measures of innovation and productivity may be related to the level of capital deployed in an industry. In previous discussions we mentioned the possibility that the reason employment in manufacturing has decreased is that substitution away from labour and towards capital may have taken place in the face of technological change. Figure 9 presents a measure of “capital intensity” on an industry basis at the national level. This measure, expressed as a ratio, is derived by dividing the value of the net capital stock (in current prices) for each industry by the employee count for the industry in 2005. It is a crude way of measuring the value of capital used per worker in a sector. We see that none of the manufacturing categories is especially capital intensive, though wood and paper products manufacturing is somewhat prominent. For manufacturing as a whole the ratio is 0.1034,

meaning that approximately \$103,400 of capital is deployed for each worker in manufacturing. The more capital intensive sectors are somewhat predictable (Mining, Utilities, Property and Business Services and Local Government).

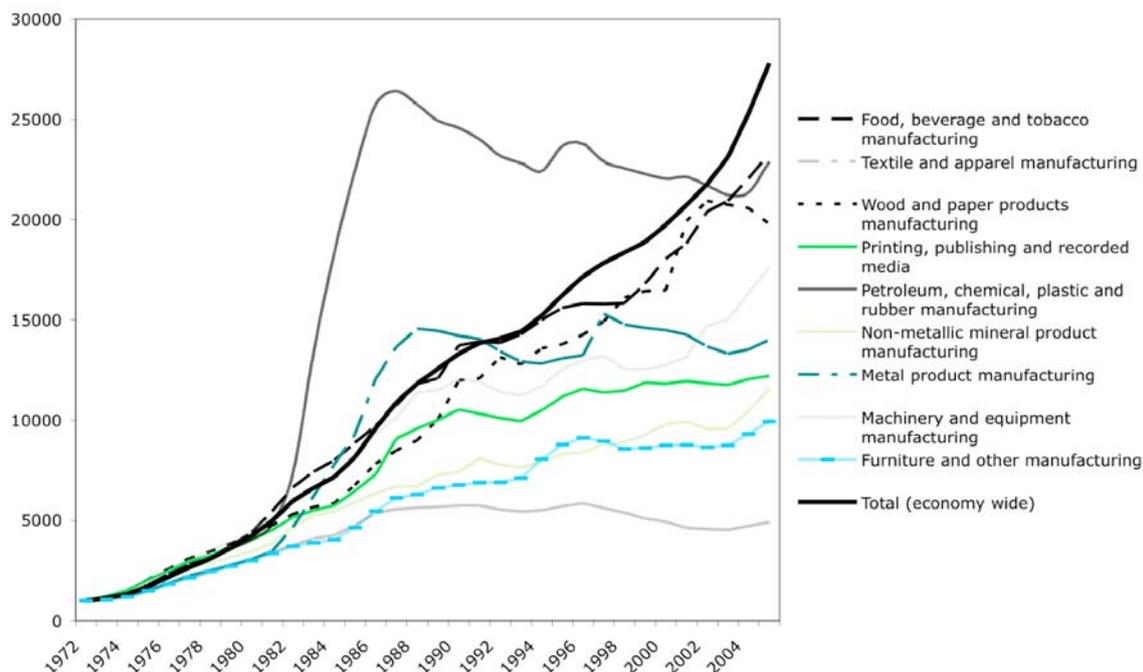
Figure 9 Capital intensity by industry, 2005 (\$m)



Source: Statistics New Zealand National Accounts (Capital Stock Tables), Business Demography Statistics

Using a net capital stock time series we can assess growth in capital stocks over time (see Figure 10). The figure shows that, with few exceptions, most manufacturing sub-sectors experienced growth in net capital stocks that was below average (economy wide) over the period 1980-2005. The most obvious exception was petroleum, chemical, plastic and rubber manufacturing. We would expect the large increase to be explained by the Marsden Point oil refinery.

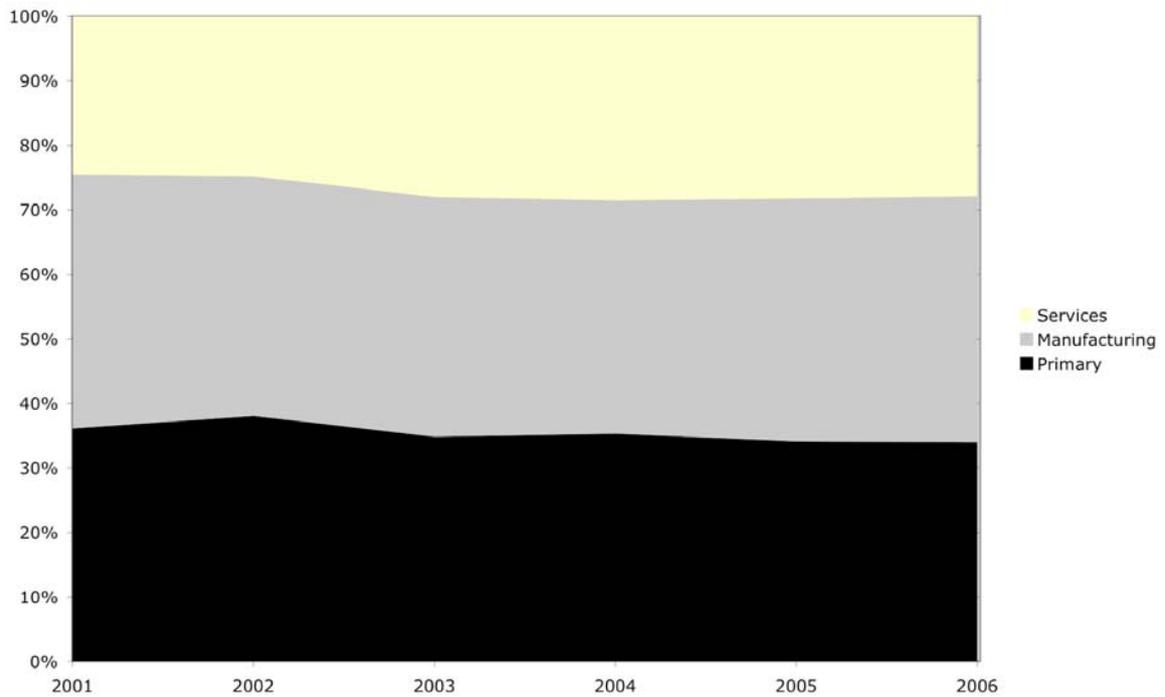
Figure 10 Index of net capital stock growth, (1972=1000)



Source: Statistics New Zealand National Accounts (Capital Stock Tables)

We view exposure to the rest of the world as being represented by exports. As mentioned in Fabling, Grimes, Sanderson & Stevens (2008), firms that participate in the external sector are likely to be more productive/innovative due to the exposure to ideas and competitive influences. Figure 11 below shows the share of total value of exports explained by the various sectors- primary, manufacturing and services. While the data is in current prices (so needs to be interpreted cautiously as it might reflect changes in prices rather than volumes), it does show manufacturing has the greatest share in all years. There are only slight changes over recent years, with services showing some growth, largely at the expense of primary, but also marginally at the expense of manufacturing. In other words, making things still matters in terms of New Zealand's exposure to the rest of the world.

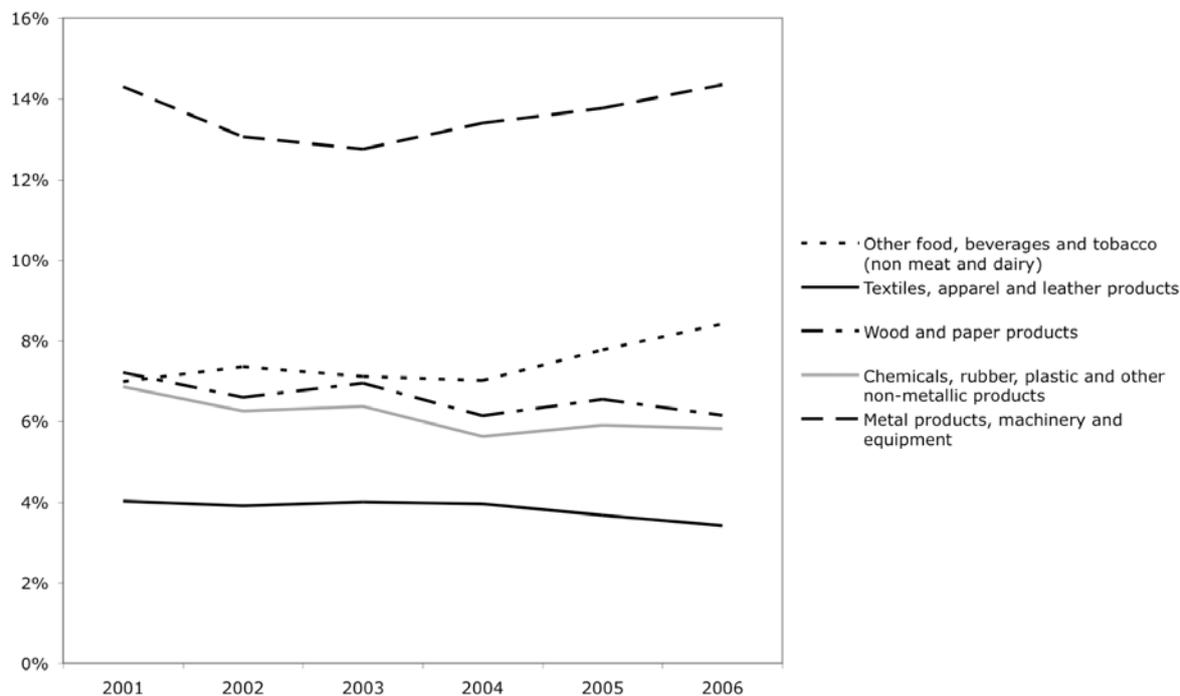
Figure 11 Share of total exports by broad sector



Source: Statistics New Zealand (Balance of Payments, Table 2F1)

For manufacturing alone, some quite clear differences emerge, though the data series is relatively short. Metal products, machinery and equipment and non meat and dairy related food, beverage and tobacco manufacturing seem to be on an upward trajectory. This is from a reasonably large base already. When viewed in the context of the employment shifts noted above in Auckland city in the last few years, it is a further sign that Auckland city may actually be participating in the export story around changing food tastes in non-western countries, when previously it may have been thought that such a story was restricted to agriculture.

Figure 12 Share of total exports by manufacturing sub-sector

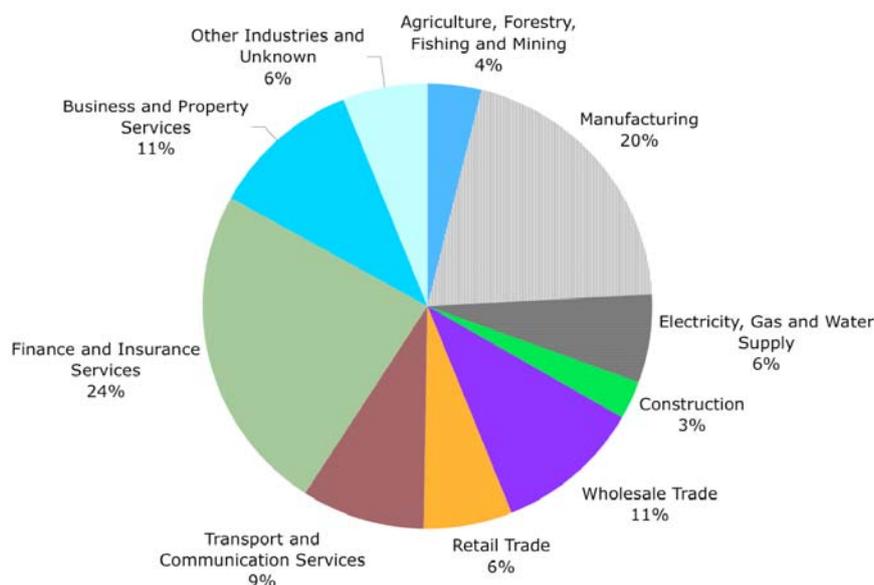


Source: Statistics New Zealand (Balance of Payments, Table 2F1)

3.1.4 Other aspects

Manufacturing as an industry is a major contributor to company taxes. The most recent available data (for the year ended 31 March 2001) shows that manufacturing was second only to finance and insurance services in terms of its contribution to the overall company tax take (see Figure 13). While there is undoubtedly a scale issue, in that there are simply a large number of manufacturing firms, it also indicates that, *prima facie*, that there are profit opportunities in manufacturing. To the extent that manufacturing activity continues to evolve towards higher value-added undertakings domestically and more routine processes being done off-shore (with consequent cost savings), we might expect manufacturing to continue to be a major source of company tax revenue.

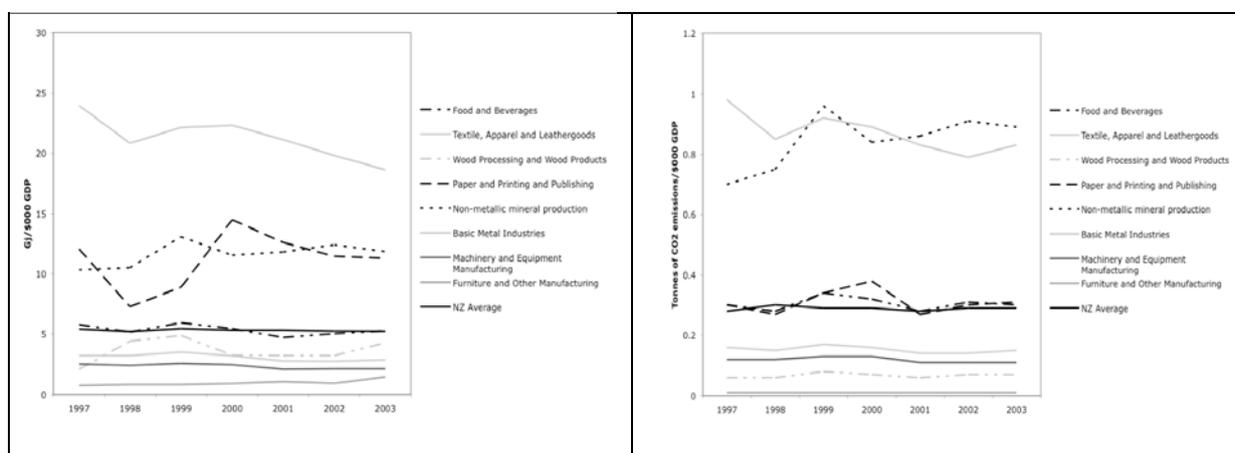
Figure 13 Contributions to company tax by industry, 2001



Source: Inland Revenue Department: http://taxpolicy.ird.govt.nz/publications/files/html/outturn_6_01/outturn_6_01.html

The variation within the manufacturing industry is further highlighted when looking at energy intensity and carbon-based emissions. Figure 14 presents data on energy intensity and carbon dioxide emissions for manufacturing sectors and the industrial average for New Zealand, in 2003. It shows that the basic metal industries, non-metallic mineral manufacturing and paper, printing and publishing sectors above average in terms of both their energy intensity and emissions (of carbon dioxide). Such trade-offs between output (GDP) and use of energy and emissions by-products are becoming increasingly more important in policy development.

Figure 14 Energy intensity and emissions



Source: Statistics New Zealand, Energy, Economy and Emissions, 1997-2003

The final aspect of our examination of manufacturing is the degree to which manufacturing activity is connected with other industries. Using publicly available figures we are able to see that, with the exception of Petroleum refining, manufacturing (in terms of output) is generally reasonably well linked in with other sectors of the economy. While not a direct measure of connectedness, regional multipliers give an indication of the degree to which activity in particular sectors affects the rest of the regional economy. Table 2 lists Auckland regional multipliers for manufacturing at the 126-sector level.⁴ These are type two multipliers- meaning they include the indirect and induced impact of changes in output.

We can see that some sectors, such as structural, sheet and fabricated metal product manufacturing and other machinery based manufacturing have multipliers that suggest an additional \$1 in final sales results in these sectors leads to additional output in the economy of over \$2. In contrast, the multiplier for petroleum refining shows that an exogenous, \$1 change in final sales in that sector only leads to an additional \$0.54 change in output in the wider regional economy. The employment multipliers measure the extent to which an additional job in the particular sector creates additional employment elsewhere in the economy.

Some caution should be exercised when interpreting these numbers, as they are based on the additional employment needed to accommodate a change in activity associated with changes in expenditure. That is, they assume a fixed employment to expenditure ratio. Because of the nature of calculation, sectors that are heavily capital intensive might have employment multipliers that are “artificially” high. For instance, the multiplier for the dairy product manufacturing sector suggests that for every additional job in that sector 5.52 jobs are created elsewhere in the economy. The artificiality is due to the expenditure required to generate an additional job in the sector. As a capital-intensive sector, the capital to labour ratio is relatively large (meaning lots of capital and not much labour). In order to generate an additional job in this sector, relatively large amounts of expenditure are required (which would be distributed to capital as opposed to labour). Given such expenditure, there will be demands in other sectors associated with the machinery. These other sectors are more labour intensive, thus the ratio of the change in employment in the overall economy to the change in the affected sector is large.

Nevertheless, the figures in the table generally show a sector that is well connected to other parts of the economy.

⁴ For a full list of regional multipliers see Walton (2006)

Table 2 Regional multipliers, manufacturing

Sector	Output	Employment
Bacon, ham and smallgood manufacturing	3.12	2.88
Dairy product manufacturing	2.29	6.52
Fruit and vegetable, oil and fat, cereal manufacturing	3.10	4.09
Bakery, sugar and confectionery manufacturing	3.06	3.13
Seafood processing	3.04	4.61
Other food manufacturing	2.66	2.89
Soft drink, cordial and syrup manufacturing	2.51	5.33
Beer, wine, spirit and tobacco manufacturing	2.86	5.32
Textile manufacturing	2.79	2.35
Clothing manufacture	2.70	1.64
Footwear manufacture	2.72	1.93
Other leather product manufacturing	2.49	2.25
Log sawmilling and timber dressing	3.46	3.30
Other wood product manufacturing	2.81	2.36
Paper & paper product manufacturing	2.84	4.24
Printing and services to printing	2.88	2.17
Publishing, recorded media manufacturing	2.98	2.44
Petroleum refining	1.54	4.93
Petroleum and coal product manufacturing	2.75	2.37
Fertiliser manufacturing	2.64	6.33
Other industrial chemical manufacturing	2.61	3.97
Medicinal, detergent and cosmetic manufacturing	2.76	3.37
Other chemical product manufacturing	2.69	3.63
Rubber manufacturing	2.58	2.56
Plastic product manufacturing	2.46	2.40
Glass and glass product and ceramic manufacturing	2.70	2.13
Other non-metallic mineral product manufacturing	3.01	3.87
Basic metal manufacturing	2.60	3.26
Structural, sheet and fabricated metal product manufacturing	3.20	2.60
Motor vehicle and part manufacturing	2.71	3.48
Ship and boat building	2.81	1.96
Other transport equipment manufacturing	2.54	2.37
Photographic and scientific equipment manufacturing	2.76	2.29
Electronic equipment and appliance manufacturing	2.99	2.80
Agricultural machinery manufacturing	3.07	2.28
Other industrial machinery & equipment manufacturing	3.10	2.23
Prefabricated building manufacturing	2.54	2.04
Furniture manufacturing	2.81	1.92
Other manufacturing	2.67	1.66

3.2 Summary

This section has used data at national and regional levels to infer some key perspectives on manufacturing in general, and Auckland's role in the sector.

The information has shown that:

- The trend for manufacturing as a source of employment is declining nationally, and in Auckland.
- Manufacturing is responsible for a significant component of the regions GDP; and that GDP growth, albeit slow, is continuing. This is consistent with other regional experiences.
- Manufacturing has a notable role in exports, and Auckland may be playing a key role in the export of food and beverages. This is important as exports provide exposure to new innovations, helping to lift competitiveness.
- Manufacturing has a reasonable degree of connectedness to other sectors. Therefore decline in this sector might be expected to negatively impact on the performance of other sectors also.

4 Trends in Manufacturing

Having set out an impression of what manufacturing looks like in Auckland, this section provides detail of some key historical and current trends that have or are impacting manufacturing across the globe. A place specific overview of manufacturing in two Australian cities is also given.

This section would be usefully read alongside Auckland City Council's own paper: "Global and International Trends in Manufacturing", which provides greater detail of certain areas.

4.1 Historical

A key historical perspective with relation to shifts in manufacturing activity in cities, has been the changing relationship between labour costs, capital investments, and transport costs. This has been most starkly observed in the U.S. North-East and Mid-West.

The reasons for the exodus of manufacturing from central cities in the U.S Mid-West and North-East reflects shifts in production technologies along with the significantly reduced role of labour. Additionally, these cities are densely populated and somewhat congested, neither of which are conducive for production activity. The initial incentive for manufacturing firms to locate in central cities was based on the desire to minimise transport costs for both workers and for raw materials. However, advances in transportation technologies and rising living standards have suppressed these factors⁵.

In earlier periods, factories were extremely labour intensive. However with labour-saving technologies in place, manufacturing can now produce more output with less labour. It has been estimated that it takes 200 U.S. manufacturing workers to produce the same amount of product as 1,000 workers in 1950⁶. Analogous outcomes were found by Graham & Spence (1995) for London, and Pilat, Cimper, Olsen & Webb (2006) for OECD countries more generally.

While the opposing forces to manufacturing in central cities appears to be very strong, many governments have vigorously fashioned public policies in order to preserve manufacturing jobs. While assessments of the direct impact of these policies are limited, recent research by Lee (2007) suggests that development incentive programs have only marginally affected decisions concerning the relocation of manufacturing activity.

4.2 Current

Taking into account these major transport-technology led changes, what other patterns and trends are now affecting manufacturing's role and position in the urban economy? This section outlines areas worthy of further attention, and provides discussion around the role of manufacturing in Sydney and Brisbane.

4.2.1 Concerns related to "Hollowing Out"

Hollowing out refers to the following scenario:

"A successful New Zealand company is bought by a foreign owner, moves offshore, de-lists from the stock exchange and takes with it both assets, and professional and capital market capacity. In one fell swoop, a nation's loss becomes a global gain"⁷.

⁵ http://midwest.chicagofedblogs.org/archives/2006/07/manufacturing_e_1.html

⁶ http://midwest.chicagofedblogs.org/archives/2006/07/manufacturing_e_1.html

⁷ www.auckland.ac.nz/uoa/about/news/articles/2006/08/hollow_out.cfm

As concerns over the emaciation of the productive cores of many industrialised countries have continued, anxieties have also emerged with regard to the offshoring of manufacturing activity from Auckland. However, while instances such as Fisher & Paykel's relocation of manufacturing activity to Thailand raises alarm bells, this must be distinguished from hollowing out given that the proprietary rights over the activities have not been transferred through a foreign acquisition.

Many commentators in the U.S. regard hollowing out as more myth, than reality. In part this is because manufacturing firms have been rapid innovators, which, by increasing their value added offer, has helped to mitigate cost pressures. Others ascribe the myth sentiment to the wide-ranging claims that hollowing out has had crippling effects on blue-collar workforces. In reality, authors argue that employment shifts have been more cyclical than structural.

It should be noted, moreover, that trends of hollowing out are showing signs of reverse in Japan. Here globally spread firms are increasingly investing in production activities within the country.

A further perspective raised in the news media here, is that even if an owner of an Auckland based manufacturing firm sells his/her business to a foreign investor, who then closes down local activity, the monies received from the sale of the business may be put to an equally productive purpose (i.e. into new start up firms)⁸.

We are unaware of any research that has examined the nature and extent of hollowing out in Auckland. To generate a greater understanding, we suggest that case studies would provide a useful lens.

4.2.2 Linking Innovation and Manufacturing

Manufacturing has the potential to be a major source of technological progress, as experienced in overseas. As the High-Level Group on Manufacturing in Ireland (2008) note:

“Manufacturing continues to be an important and integral part of the economy... High value added manufacturing, in particular, is a key driver of innovation and technological advance. It increases opportunities for attracting and embedding R&D activities, collaboration with the higher education sector and stimulating networks”.

Auckland City Council's own research notes: “the shift to higher value, higher tech manufactures has escalated the importance of knowledge input to manufacturers”. Additionally, the paper comments on the need for innovation given rapidly decreasing product lifecycles, as well as the opportunities that exist to create a sustainable competitive advantage through inimitable product or service innovations. However, it is also noted that many manufacturers, through an underinvestment in R&D, are not realising their full competitive potential. This may be due to the business environment in which they are embedded, or simply their focus on short-term production outcomes.

In the academic literature, Ulku (2008) examined international sector level patent and R&D data to examine the hypothesis that the long term growth rate of output in four manufacturing sectors in OECD countries is driven by the rate of innovation, which is in turn determined by knowledge stock and R&D intensity. The author found that:

“knowledge stock is the main determinant of innovation in all four manufacturing sectors and that R&D intensity increases the rate of innovation in the chemicals,

⁸ www.nzherald.co.nz/topic/story.cfm?c_id=190&objectid=10466381&pnum=0

electrical and electronics, and drugs and medicines sectors. In addition the rate of innovation has a positive effect on the growth rate of output in all sectors”⁹.

Additionally the author found strong support for the notion that a “high degree of openness to international trade has a positive impact on both the rate of innovation and the growth rate of output in the majority in the majority of sectors”.

4.2.3 Linkages with the Service Sector

Research shows that the boundaries between manufacturing and service activities are blurring. As the head of one manufacturing firm in Ireland noted:

“Manufacturing firms today need to focus on delivering a vision of something better value... Providing after sale service and responding to customer feedback are essential elements to creating a compelling and distinctive proposition”.

Moreover, as the High-Level Group on Manufacturing in Ireland (2008) comment:

“To succeed today, businesses must be closer to their customer, building an in-depth understanding of their needs so that they can develop and deliver innovative products, services and solutions”.

In essence a focus on services has emerged from a determination by manufacturers to extract greater value from their product by offering consumers “whole solutions”. Services are also extending to the destruction and removal of products at the end of their lifecycle, given a greater environmental consciousness in the business community.

A key question emerging here, is to what extent does manufacturing’s service interface require spatial proximity with other service firms, pools of labour and the consumption market? Research by Daniels & Bryson (2002) suggests that cities, in providing such proximity, will be important, and that, given the knowledge based nature of manufacturing-service activities, urban resources such as universities and science parks will also have a key role.

It is clear from a reading of the existing Auckland City District Plan, that the blurring between services and manufacturing is being recognised.

4.2.4 Positioning in Australasian Cities

Central to Auckland’s manufacturing future, may be the role it plays in the Australasian system of cities. This is important, as shifts in global manufacturing value chains, may have a critical bearing on the activities that take place here.

As a high level snapshot, research by SGS Economics and Planning (2004) shows that:

“Melbourne has emerged as the dominant Australian city in manufacturing (particularly measured by employment share) and in related research and development, but Sydney’s national share of manufacturing output is higher than Melbourne’s, indicating it maintains a key role in secondary production. The city’s stock of advanced business services – providing value added inputs and brokering access to capital - undoubtedly plays a part in this continuing strong performance”¹⁰.

⁹ Ulku (2008)

¹⁰ http://www.metrostrategy.nsw.gov.au/dev/digitalAssets/435_1087439419590_924eea%20_summary_JUNE2004.pdf

SGS Economics and Planning (2004) also note that:

- Key specialisations in manufacturing and related services have been developed in Adelaide.
- Manufacturing is a key component of Australia's export generated wealth.

In the following sub-sections, the manufacturing economies of Sydney and Brisbane are discussed in greater detail.

4.2.4.1 Sydney

Manufacturing is recognised as a key growth area, and forms a crucial part of the city's planning under the state government's Metropolitan Strategy. Manufacturing industries provide the largest contribution to Gross State Product in NSW¹¹.

The Metropolitan Strategy provides an outline of manufacturing's changing nature in Sydney:

“The nature of industry in Sydney is shifting towards knowledge-based activities in industries such as pharmaceuticals, information and communications, and advanced *manufacturing*. There is a trend towards cleaner industries and changing work and business practices. Many of these activities prefer to locate in business parks”¹². [self italicised]

In terms of the spatial shifts in manufacturing activity, SGS Economics and Planning (2004) observe patterns of decentralisation occurring. They note:

“The decentralisation of ‘industrial’ activity, particularly in ‘Manufacturing’ and ‘Transport and Storage’ ... has driven employment growth in Blacktown, Baulkham Hills, Penrith and the Outer South West”.

As an example of the city's focus on high-value added outputs, the following manufacturing activities are currently being undertaken:

- In aerospace, maintenance, repair and overhaul are key strengths as well as component and engine manufacture. Boeing and BAE Systems have major operations, while Turbomeca Australasia and Eurocopter also have headquarters.
- Rail and transport systems manufacturing includes the rolling stock specialists United Goninan and EDI Rail.
- Automotive components manufacturers include US Group Dana, which exports axle sets to Ford and Mazda in Thailand, and Broens Industries whose client base includes Mercedes Benz and General Motors Holden.
- The marine industry has a strong defence focus with headquarters for Tenix, ADI and Forgacs.
- Precision manufacturing companies such as biomedical experts Cochlear, ResMed and Ventracor as well as avionics and communications supplier Rockwell Collins.

In summary, manufacturing activities are being encouraged to locate in the city¹³. In terms of specific roles played by the state government, the NSW Department of State and Regional Development note:

¹¹ www.metrostrategy.nsw.gov.au/dev/digitalAssets/1884_1173073763968_ELTF_ACTIONPLAN_MARCH2007_NOMAP.pdf

¹² www.metrostrategy.nsw.gov.au/dev/digitalAssets/1884_1173073763968_ELTF_ACTIONPLAN_MARCH2007_NOMAP.pdf

¹³ www.business.nsw.gov.au/NR/rdonlyres/4CAB79AE-0EEC-4132-8550-C702CD82F218/0/INV_HM_062006.pdf

“Twelve Cooperative Research Centres (CRCs) are dedicated to manufacturing technologies, and bring together researchers from industry, universities and government laboratories... Manufacturing related CRCs include institutions focused on advanced composite structures, metals casting manufacturing and intelligent manufacturing systems and technologies, such as robotics and mechatronics”¹⁴.

This shows that the NSW State Government is linking up with universities and industry (as suggested by Porter in his seminal thinking on regional innovation) to advance the prospects of manufacturing in Sydney.

4.2.4.2 Brisbane

“Manufacturing industries will make the greatest contribution to Brisbane’s export growth in the years to 2026, followed by property and business services and transport and storage”¹⁵. Manufacturing will also continue to be a major employer in Brisbane over the next twenty years (although the manufacturing employment growth predicted for Brisbane, is anomalistic within Australia).

Providing further detail on the nature and extent of the manufacturing sector in Brisbane, Brisbane City Council notes:

“Total manufacturing produces over \$25 billion of output and contributes nearly 21 per cent of all output in the region. The largest manufacturing sectors are chemicals and petroleum with almost \$7 billion in output and food, beverages and tobacco with over \$5 billion in output. The chemicals sector produces 5.5 per cent of the region’s output with 0.9 per cent of the employment and food produces 4.4 per cent of output with 2.8 per cent of employment”¹⁶.

Notable manufacturing firms in the Brisbane area include:

- Capral Aluminium Ltd - Australia’s largest aluminium extrusion facility.
- CMI Ltd - Major automotive component manufacturer.
- Smorgon Steel - Australia’s largest producer of steel tube and other steel fabrication-related products.

Brisbane boasts a large human capital base tailored to manufacturing activities. Invest Brisbane notes that over 15,000 students are enrolled in engineering technologies in Brisbane universities. Moreover, a further 40,000 are enrolled in manufacturing related courses in Technical and Further Education (TAFE) in Queensland¹⁷.

Furthermore, it is noted by both policy and media sources that a key feature of manufacturing’s success and growth in Brisbane is the city’s proximity to the Asian market relative to other Australasian cities.

Other factors in favour of manufacturing growth in Brisbane include:

- High natural amenity factors (relative to both firms and workers).
- Advanced manufacturing infrastructure (including CRCs).
- Competitive utility costs.

¹⁴ www.business.nsw.gov.au/investment/industries/manufacturing.htm

¹⁵ http://www.brisbane.qld.gov.au/bccwr/plans_and_strategies/documents/20061019_economicdevelopmentplan_full.pdf

¹⁶ http://www.brisbane.qld.gov.au/bccwr/lib71/parta_nieir_final_report_economic_forecasts_for_bt1p_october_2005.pdf

¹⁷ www.investbrisbane.com/industries/innovative-manufacturing/why-brisbane.aspx

- Extensive and efficient road and rail networks.
- Low cost sites close to key transport infrastructure.

Finally, it may be instructive for Auckland City Council to note that while the inner city areas of Brisbane are strongly dominated by business services, the outer regions, particularly the Outer East, Outer North-East and Outer South, have a strong manufacturing presence. As with decentralisation being observed in Sydney, such trends may be important when trying to distinguish between intra-urban manufacturing shifts, from shifts outside the metropolitan area altogether.

4.2.4.3 Key Points

The following key points can be made about manufacturing in Australian cities:

- Manufacturing in both Sydney and Brisbane is showing signs of decentralisation to outer areas of each city.
- Both Sydney and Brisbane are encouraging high-value added manufacturing activities.
- Initiatives to promote manufacturing include state governments working alongside industry and universities to promote improved technological take-up and R&D.
- Manufacturing is a significant component of Australia's export production.

We further consider the overseas context in our discussion on optimality in Section 6.

5 Perspectives from the Agglomeration Literature

In this section we outline some of the key concepts and issues in the agglomeration literature, in order to offer explanations relating to the concentration of manufacturing activities in cities.

5.1 What is Agglomeration?

Agglomeration theory argues that the congregation of businesses and workers in cities is caused by the existence of positive externalities, which, when combined with more defined specialisations, serves to “raise the efficiency of firms”. The positive externalities, as seminally outlined by Marshall (1920), are input-output improvements, thicker labour markets, and knowledge spillovers¹⁸.

Co-location has been interpreted in the agglomeration literature in terms of both urban “scale” and “density”. At this point we are agnostic as to whether scale or density is most important for manufacturing in Auckland.

5.1.1 Form of Agglomeration

5.1.1.1 Localisation Economies

Localisation economies are where firms achieve agglomeration benefits through co-location with other firms in the same industry. In manufacturing, in this regard, the concentration of manufacturing firms in Auckland may serve to encourage other manufacturing firms to locate there also.

In studies of manufacturing concentrations overseas, localisation economies have been found to be particularly prominent. In this regard, it is likely that input-output linkages and thick labour markets will act as particularly strong drivers (although Saxenian’s (1994) analysis of agglomeration processes in Silicon Valley points to the importance of knowledge spillovers also).

5.1.1.2 Urbanisation Economies

As discussed above, it has been widely remarked that manufacturing and service activities are increasingly blurring. However, an interesting question can be raised when considering ties across industries: to what extent does manufacturing rely on proximity to other industries?

Although this has distinct definitional implications relating to what is “in” and “out” of an industry, “urbanisation economies” reflect the benefits that can be achieved through the concentration of activities at an inter-industry scale. In other words the concentration of activity in one sector provides an incentive for activities in other sectors to locate there, given the linkages between them.

Urbanisation economies also take into account the benefits for firms, when they have access to key urban infrastructure (motorways, ports, rail hubs etc). Such considerations may have a major bearing on the location decisions of manufacturing firms.

Research by Maré & Timmins (2006) provides a useful discussion of urbanisation and localisation economies in the context of New Zealand industries.

¹⁸ However, recent research by Helsey & Strange (2007) also points to the importance of reducing transaction costs as a driver of agglomerations.

5.1.2 Industry Maturity

A key feature of the agglomeration literature, in particular the scholarship of Duranton & Puga (2005) and Kuncoro, Henderson & Turner (1995) is that a firm's disposition to locate in a large urban conurbation may be influenced according to whether it's respective industry is in its infancy or maturity. In this respect, research shows that firms in emerging industries have a tendency to locate in big cities so that they can profit from the advantages of urban diversity - including being around the activities of other sectors, a diverse population and innovation processes. As a corollary, research also shows that firms in mature industries, where markets and production processes are relatively standardised, have an incentive to move to small cities in order to take advantage of cheaper factor prices (notably land rents), which outweigh the benefits of diversity.

To effectively identify dynamics relating to industry nascency and maturity within manufacturing, information at a sub-sector level will be required.

5.1.3 Functional Specialisations and Intra-Firm Separation

Duranton & Puga's (2005) paper noted the ascendancy of functional specialisations vis-à-vis sectoral specialisations. Functional specialisations occur where there is a concentration of like activities in an urban area. Critically these activities provide inputs across a range of sectors. Duranton & Puga (2005) contend that such a phenomenon is becoming increasingly prominent in the U.S., with growing concentrations of business and financial functions in large cities (and with the increasing dispersion of routine production activities to smaller cities). However, it is plausible that functional specialisations may also occur in manufacturing production in large cities, where a widget is produced that can be used as an input for a range of sectors and markets.

Picking up Duranton & Puga's idea, a recent paper by Henderson & Ono (2008) examined the intra-firm separation of headquarters and production facilities, with the HQ remaining in the large metro area. The authors looked specifically at the trade off between 1) having a greater ability to outsource service functions in the large metro area, and to effectively obtain information about market conditions for their products, and 2) the costs of co-ordination associated with managing plants from afar. The paper makes some key findings, including that it is very costly for firms to send their first stand alone HQ away from their production facilities, unless the new area in which the HQ locates provides significant agglomeration benefits in services. However, once this has occurred, the authors note that firms are increasingly focused on enhancing and maximising their outsourcing possibilities.

5.1.4 Home Market Effects

Home market effects suggest that, with the presence of transport costs, producers will look to locate proximate to markets where there is high local demand for what is being produced. First conceptualised by Krugman (1980) at the country level, home market effects have also been examined in the urban agglomeration literature to explain the location of firms in cities.

Rosenthal & Strange (2004) outline home market effects, in the urban context, as follows:

“Suppose that increasing returns lead to the concentration of employment in a large factory. This in turn, creates a large market, which, in the presence of transport costs induces other firms to choose the same location. The idea here is that the interaction between internal scale economies in production and transport costs lead to a “magnification”, where home market size expands in a self-reinforcing process of agglomeration”.

Simply put, the market with a larger share of the total demand across all locations should have a

higher than proportional share of total manufacturing output across all locations (Dinlersoz, 2002).

In a study of Japanese regional concentrations in manufacturing, Davis & Weinstein (1999), having identified that there are substantial increasing returns in eight out of nineteen manufacturing industries examined, conclude that home market effects may be a critical factor behind the agglomeration of manufacturing activity being observed.

In a more recent study, Dinlersoz (2002) found that the home market effects appear to be important for some, but not all, manufacturing industries in the U.S. The research also shows critical relationships between home market effects and transportation costs. First, home market effects become more pronounced as transport costs decline, second, below some threshold of transport costs, the home market effect disappears.

Our interpretation of this is that it depends on the level of transport costs that exist in the first place. For instance, where transport costs are very high, the costs of getting to market will outweigh the home market effects, so firms have little incentive to develop economies of scale. High transport costs lead to fragmented markets and become prohibitive in terms of the generation of agglomerations. When transport costs lower, home market effects become more realisable for firms.

As transports costs move closer to zero on the other hand, there is also a point where the ability to access the large market from afar outweighs the need for firms to be spatially proximate. In this case, with low transport costs, firms can take advantage of lower factor costs (especially land costs), while still maintaining access to the large market (assuming that agglomeration benefits occur through no other mechanism).

The implications of home market effects for Auckland mean that, due to the existence of transport costs and increasing returns through scale economies, the exit of manufacturing activity will not necessarily result in relocation to other parts of the country. In essence, Auckland's large market may critically underpin the nature and extent of manufacturing that currently takes place. We suggest, however, that this issue relates more to the exit of manufacturing activity from the region as a whole, than of shifts in activity from Auckland City to other areas within the Auckland region.

Further research, in the form of firm surveys and case studies, may usefully examine the extent to which home market effects have a role in the location decisions of manufacturing firms within Auckland city and the Auckland region.

6 Ways to think about Manufacturing in Auckland city

The material in Sections 3, 4 and 5 provides an overview of manufacturing as an industry, and discusses some of the key principles underpinning the concentration of manufacturing activities in cities. Data on industry characteristics and facets of agglomeration theory, however, are useful only in as much as it can be assessed against a set of principles and criteria relevant to any decision needing to be made. The purpose of this section, is, based on material gleaned from the economics and urban geography literatures, to outline such principles and criteria.

The first consideration affecting what principles and criteria are outlined, which will input into a wider decision-making framework, is the extent to which instruments are available to the decision-maker. It is no use constructing an elaborate decision framework that identifies possible actions to take, if those actions are not in the choice set of the decision maker.

In saying this, discussing relevant criteria and principles should not be solely conditioned on availability of control levers. If the principles and criteria offer useful insights on issues, or help to see things in a new or more focussed light, independent of the actions available, utility can still be achieved. Moreover, setting out key principles and criteria allows, in the course of devising a wider decision making framework, for useful information to be derived and made accessible in the future if decision-making powers, or tools that have influence on the issue, do become available.

The principles and criteria are discussed individually below. We start with the question of intervention. That is, even if tools are available, why would Auckland City Council intervene and secondarily, does it need to?

6.1.1 Intervention logic

The implicit assumption in undertaking this work is that the Council is interested in how they should think about manufacturing. Perhaps the more pertinent issue should be why or whether the Council should be thinking about manufacturing at all. The most obvious reason is manufacturing's sheer size. As the material above shows, manufacturing plays a significant role in the Auckland city and regional economies. Moreover, this position of significance is not a contemporary phenomenon. Auckland has traditionally been a major centre for manufacturing activity, due to obvious factor endowments such as a large and educated labour force, a (historically) relatively easily accessible port, a large international airport, many waterways and other thick market effects. While size and history are not insignificant, the wider question is whether size and history are significant enough to warrant potential action from the Council? In other words, what is the problem that intervention may be designed to address and why we would not expect market forces to remedy this?

6.1.1.1 Market Failure

A common first step is to consider whether there are any market failures - conditions, which, if present, mean that markets will be inefficient. Intervention is needed in order to correct the market failure and government actions are often justified on this basis. There are three basic market failures:

- Imperfect information - the absence of perfect information may lead to market power and imperfectly competitive structures such as monopoly. Results in inefficient pricing.
- Externalities - unintended effects (both positive and negative) on parties not part of the original transaction/activity. Results in inefficient production.
- Public goods - things are both non-rival in consumption and non-excludable. Results in both pricing and provision inefficiency.

A cursory consideration of manufacturing in Auckland city suggests that there is no major market failure that would give rise to the need for intervention designed to influence the industry. While there may be possible negative externalities associated with pollution/emissions that could justify intervention to limit the extent of polluting/emitting activity, trading mechanisms designed to internalise any of these externalities are being developed by central government.

One possibility, however, is the issue of first, second, and third degree path dependencies, raised by Leibowitz & Margolis (1995). First degree path dependencies have a “sensitivity to starting points exists but has no implied inefficiency”. Second degree path dependencies have a “sensitive dependence on initial conditions which leads to outcomes that are regrettable and costly to change. They are not, however, inefficient in any meaningful sense, given the assumed limitations on knowledge”. In essence, the authors are referring to bounded rationality, as the “inferiority of the chosen path” was unknowable at the time the decision was made. Third degree path dependency is perhaps most interesting, given that it provides room for improvements to be made to the path. In this case, the error which gives rise to an inefficiency was avoidable. In the case of manufacturing in Auckland, a third degree path dependency may have arisen where there was knowledge about other more profitable options for the use of manufacturing land, held by actors, but these actors failed to take advantage of it. Manufacturing then became embedded through further decisions in support of its growth. However, it is plausible, that the seeming inevitability of the path dependency that sees manufacturing located in Auckland city may be remedied by an institutional intervention, even in the “market for land”, that leads to an improved outcome. To unravel or clarify this possibility, further research is required.

With an awareness of the possibilities mentioned above, there is nothing else to suggest that the prices faced by consumers for the output of the manufacturing industry are in anyway inefficient and consumers could benefit from intervention.

6.1.1.2 Efficiency

Other aspects of efficiency, that affects manufacturing, may justify action by the Council however. The fixed supply of land is one such aspect. In the face of supply constraints but burgeoning demand, the Council needs to make land use/allocation decisions with the best interests of their community in mind. In determining optimal land use, Council should consider, *inter alia*, the following:

- *Allocative* efficiency - resources (including Council resources) should flow to areas that maximise benefits (i.e. provide the highest return).
- *Dynamic* efficiency - resources flowing to areas of maximum benefit over time, including consideration of innovation and responses to technological change.

6.1.1.3 Existing Interventions

A key factor in any decision is the degree to which intervention is already taking place. It is not always the case that further intervention has linear effects. Existing intervention may be adding to the problem rather than addressing it. In such cases further intervention may exacerbate issues to the extent that the (negative) effects are more than proportional. On the other hand, if there are existing controls or policy in place, then it might be argued that participants in the market/industry are already accustomed to operating in such conditions, and some intervention that is designed to adjust rather than change underlying conditions could be beneficial. It is always, and forever, a delicate balancing act. It is important to remember that intervention can impede markets through Government doing things it should not do or by failing to do things it should do.

While market failure often justifies intervention, the issue of Government failure should also be borne in mind. One lens through which to view the possibility of Government failure (i.e. intervention being

more harmful than leaving markets to work) is to consider market processes at work. One such process is known as creative destruction. Where such a process is taking place naturally, it is argued that intervention could be harmful.

6.1.2 What is creative destruction?

Creative destruction, a concept most famously associated with Joseph Schumpeter, is a process that revolutionises the economic structure from within- incessantly destroying the old one, incessantly creating a new one. Innovation- bringing new goods, new markets, new methods of production, new ways of organising firms- is the fundamental impulse that sets and keeps the capitalist engine in motion.”¹⁹ This understanding of the functioning of competitive economies eschews competition on traditional things such as price in favour of competition from the new commodity, the new technology, the new source of supply and the new type of organisation. In other words, competition that strikes at the very foundations of firms and their very lives, rather than at the margins of the profits and outputs of existing firms.

The role of government (both central and local) is important from the perspective of whether and how they could influence the process. Policy has the potential to slow the process and ergo slow the rate of productivity growth. Governments can impede markets either by doing things they should not do or by failing to do things they should do.²⁰ For example, at a national level, government might obstruct entrepreneurship by setting onerous licensing rules for new firms. On the other hand, an undersupply of financial-market regulations could make it hard for firms to grow. For our purposes, Auckland City Council might influence the exit of “poor performing” firms and simultaneously restrict the entry of new firms and/or industries by virtue of its land-use planning/zoning rules.

More generally, any intervention has the potential to create rigidities that slow the process of incessant change that characterises creative destruction. In that respect, policies that look to somehow “protect” industries, firms or activities may do more harm than good from an economics perspective. In an economy where firm turnover is blocked, then, unblocking it could potentially result in a doubling of overall productivity growth (Haltiwanger, 2002). What is less clear is whether active government intervention that actually assists or precipitates the process of creative destruction is possible. While there are obvious differences between the incentives of local authorities and firms/businesses, it is not infeasible to think that, given sufficient evidence, local authorities could facilitate or even accelerate the process. The real question is whether such actions by council are efficient. Before we consider the merit or otherwise of local government undertaking activities to influence creative destruction, we first turn to the issue of identification.

6.1.3 How do we assess whether creative destruction is happening?

In an assessment of creative destruction, entrepreneurship and productivity in New Zealand, McMillan (2004) looked into whether rigidities in the economy were responsible for New Zealand’s relatively poor productivity performance over the last 15 years. Along with the number of small firms, he identifies twelve further criteria to assess an economy’s flexibility (and ergo the extent of barriers to creative destruction). The criteria are:

- Turnover of wealth
- The accessibility of the business sector
- Firms’ receptiveness to new technologies
- Regulatory impediments to doing business
- The amount of job creation and job destruction

¹⁹ Schumpeter (1975) as cited in McMillan (2004).

²⁰ This line (and much of the discussion on creative destruction) is borrowed from McMillan (2004).

- Gaps in the size distribution of firms
- The likelihood of growing from small to medium-sized
- The likelihood of downsizing
- The likelihood of becoming large
- Competitive discipline on large firms
- Hindrances to converting to share ownership
- Changes in the list of the top ten corporations

Summarising the best available data on these factors, he concludes that, in essence, markets are doing their job. New Zealand has plenty of creative destruction. In each year, many firms disappear and many grow. Barriers to entry are low and new firms start up at a rapid rate. There also seem to be no major barriers to growth or shrinkage, so those firms that are revealed to have poor prospects shrink or shut down, while those that have a marketable product and are well managed expand. The general conclusion is “if it ain’t broke, don’t fix it.” Harm could be done if policy was changed to address a nonexistent problem.

Unfortunately, an assessment of Auckland city-specific data is outside the scope of this project, but we can infer that McMillan’s analysis would apply equally as well with the Council’s jurisdiction. That is, there is no reason to suggest that Auckland would be any different, given the same general legislative and regulatory environment applies within the whole of New Zealand. In saying this, further work on the size distribution of firms, barriers to changing size (both growing and shrinking), locally derived regulatory impediments and the amount of job creation and destruction in manufacturing in Auckland city is feasible and would be useful in uncovering specific factors in Auckland city.

While we are unable (within this work) to replicate McMillan’s analysis for the manufacturing sector in Auckland, we are able to assess data on manufacturing as an industry. Manufacturing is a relatively stable industry, with below average turnover, in terms of firm exit and entry (see Table 3). From a productivity perspective this is positive, as continuing firms have higher labour productivity than either entering or exiting firms (see Table 4). When looking at dynamics, exiting firms add to labour productivity growth. This is because those firms that exit tend to have lower than average productivity and therefore by exiting, raise the average labour productivity of the stock of firms that continue to operate. While this effect is noticeable in respect of manufacturing, the magnitude is only half of the average effect in aggregate. That is, exiting firms in the manufacturing sector add around 0.7% to labour productivity growth (in the period 1995-2003), while in aggregate, exiting firms add around 1.4% to total labour productivity (Law & McLellan, 2005).

On the other hand, entering firms subtract from labour productivity growth (in their first year). This result seems intuitive. When considered against strong continuing firms and relatively weak exiting firms it is not surprising that firms tend to enter below the mean level of labour productivity. It is entirely possible that entering firms will make positive contributions over their lifetime. Again, manufacturing-specific effects are below those in aggregate. Entering firms subtract from labour productivity by about 1.3% in the manufacturing sector, while in aggregate entering firms subtract around 2.3% from total labour productivity. It is not clear why this is so. Nevertheless, there is some (weak) evidence that creative destruction is occurring and that any interventions to slow or stop this process would be deleterious from the perspective of productivity.

Table 3 Average industry entry, exit and turnover rates, 1995-2003

Industry	Entry rate	Exit rate	Turnover rate
Mining and quarrying	6.9	6.7	13.6
Manufacturing	9.6	7.3	16.9
Electricity, gas and water	8.6	5.9	14.5
Construction	11.8	8.0	19.9
Wholesale and retail trade	11.8	9.4	21.2
Transport, storage and communications	12.6	9.9	22.5
Business services	14.4	7.9	22.3
Personal and community services	10.9	6.4	17.3
Aggregate	12.1	8.2	20.3

Source: Law & McLellan (2005)

Table 4 Average weighted labour productivity of firms by industry, 1995-2003

Industry	Continuing	Entering	Exiting
Mining and quarrying	207	-28	201
Manufacturing	91	62	79
Electricity, gas and water	439	320	142
Construction	61	62	61
Wholesale and retail trade	81	35	40
Transport, storage and communications	200	126	113
Business services	99	93	98
Personal and community services	75	52	68
Aggregate	100	64	68

Source: Law & McLellan (2005)

Note- All numbers are relative to the aggregate continuing firm (whose labour productivity has been indexed to 100) and are the arithmetic averages of yearly observations between 1995 and 2003.

In the literature, analyses of creative destruction in manufacturing have been made. For instance Lee's (2007) research, on the role of plant relocations in the geographic redistribution of manufacturing industries in U.S. states, shows that high turnover rates, related to employment gains from plant openings and employment losses from plant closings, are being experienced in fast growing states. This provides reason to suggest that creative destruction may be an important growth element.

6.1.4 Available levers

As mentioned above, even if we were able to ascertain whether or not creative destruction was happening, the most important issue is the availability of levers that can be pulled to influence the process. That is, once you have decided that something needs to be done, either to assist the process of creative destruction underway or to attempt to arrest it, do you have the tools to undertake the action needed? In the Council's case, there does not appear to be an extensive range of levers for to pull. However, the major tool available, zoning, is probably the most direct. Unlike national policies around industry support, skills and training, or trade related access and barriers, zoning directly affects land use.

The ability to effectively prohibit certain activities (that give rise to certain effects) means that the Council does have a powerful lever. The major question is whether the instrument is precise enough to impact only those seen as responsible for negative effects. Often much of the discussion around what to do with manufacturing centres on protecting manufacturing activity due to its importance in

the economy. There is no question that manufacturing continues to be a major employer and has important characteristics that make it attractive economically. But, as the material above indicates, manufacturing is a diverse industry and rather than being a single story with a strong narrative, it is a series of short stories each with sub-plots of their own.

6.1.5 Optimality

What is the optimal level of manufacturing activity for Auckland city? This question is at the heart of the paper. Naturally it is a difficult question to answer. It is not clear that there is such a thing as an optimal level. The process of adjustment (both exogenously and endogenously) means that even if such a level is found it may not remain optimal for long. In saying this, we might expect some kind of steady-state to emerge over time. It appears (at least from the high level data we have examined) that manufacturing may be approaching this steady state.

Auckland is not alone in experiencing the slings and arrows of manufacturing fortune. If we examine the levels of employment in overseas cities we are familiar with, we might be able to infer whether there is some kind of natural limit or asymptote that manufacturing is tending toward. This limit could proxy for optimality.

Figure 15 gives the manufacturing share of employment in various cities²¹. While Vancouver sits slightly lower than the others and Melbourne and Adelaide slightly higher, there is not a great deal of variation in the numbers. This data suggests that Auckland city is not out of the ordinary in having a manufacturing share of total employment of 11%. Looking further into the data reveals further similarities in respect of the composition of manufacturing employment, with the obvious difference being Vancouver's wood and paper concentration (see Table 5). Auckland has particular concentrations in food, beverage and tobacco manufacturing (17%, most closely related to Brisbane, Adelaide and Sydney) and machinery (16%, most like Sydney and Adelaide). While very crude, this data suggests that Auckland is not drastically unlike other cities we frequently compare ourselves to. Of course, the devil is in the detail, but if we assume that similar issues are faced by manufacturing in each of these cities in a similar time profile (which is not implausible given the international nature of manufacturing), then it would appear that there is some kind of convergence at play.

²¹ The Australian data comes from the 2006 Census, while the Auckland City data is from the 2007 BDS. Vancouver data is from the 2007 Labour Force Survey.

Figure 15 Manufacturing employment share in selected cities

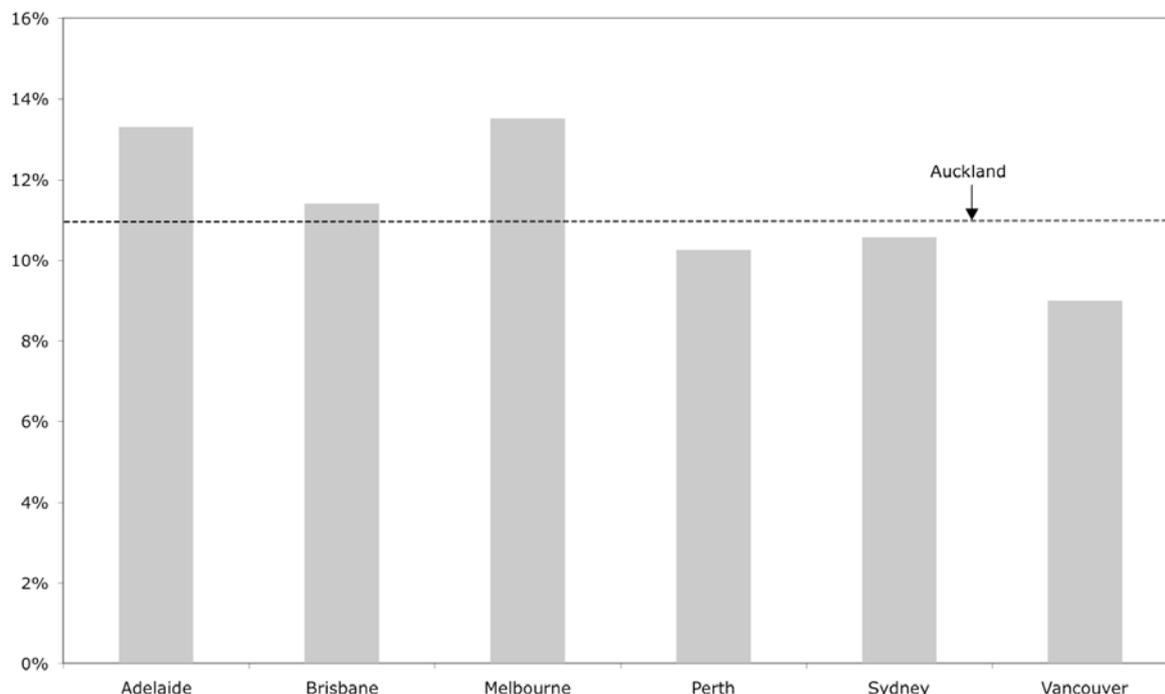


Table 5 Shares of manufacturing employment by sub-sector in selected cities

	Adelaide	Brisbane	Melbourne	Perth	Sydney	Vancouver
Food	16%	18%	14%	13%	15%	13%
Wood	3%	5%	3%	3%	4%	11%
Paper	2%	2%	3%	1%	3%	10%
Metal	11%	16%	10%	19%	10%	12%
Machinery	15%	11%	10%	11%	14%	6%
Textiles	3%	3%	6%	4%	5%	6%
Transport equipment	18%	9%	14%	7%	5%	5%
Furniture	5%	5%	5%	6%	5%	6%
Other	27%	30%	34%	35%	40%	31%

6.2 Summary

This section has identified a set of criteria and principles by which to consider the role of manufacturing in Auckland city. It also provided a consideration of logics for governmental intervention, based on the market failure framework and efficiency criteria.

The section shows that markets are working relatively well. The process of creative destruction shows evidence (albeit weak) of effect, while no major market failures have been identified (although the possibility of it existing cannot be discarded). Given this, and combined with the bluntness of the land-use levers available to Council, it is suggested that any intervention may be damaging.

7 Future Scenarios

In this section we look at three possible scenarios that may be brought about by a range of exogenous and endogenous processes (relative to Auckland City Council's capacities and tools). This synthesises much of the material set out in earlier sections.

7.1 Exit, Steady-State or Acceleration

The three scenarios we have identified are “exit” - where manufacturing leaves Auckland city; “steady-state” - where either manufacturing employment or output stays the same in Auckland city; and “acceleration” - where manufacturing activity escalates in Auckland city.

7.1.1 Exit

Manufacturing's exit from Auckland city may occur where other sectors in the economy demand spaces within the area for activity, which, by pushing up prices, forces manufacturing to seek other locations. Additionally exit may be encouraged by shifts in key global value chains, changes in the cost of labour, industry maturity, remedies to third degree path dependencies, as well as the development of economic incentive programmes in neighbouring urban areas like Hamilton and Tauranga.

A simple logic suggests that in a city where land prices tend to escalate with greater proximity to the central area, those firms that require a lot of land for production (which relative to business services, manufacturing typically does) will eventually find it more cost effective to move to the periphery. However, this logic can be distorted in a myriad of ways. For instance, such spatial dispersion implicitly assumes that sensitivity to agglomeration economies, ability to add value through innovation, sunk capital costs, and the impact of transport costs (for both goods and people) *inter alia*, is constant across all firms, and, critically, is less significant than land costs. Where these differ (as they do in reality), the primacy of land rents, as a driver of locational shifts will be mitigated. This suggests that the exit of manufacturing from Auckland city is far from inevitable.

One response to increasing land pressures, and as a form of partial exit, may be to shift the land hungry activities within a firm to another location, while maintaining particular managerial and head office functions within the city so agglomeration benefits, through services and headquarter activities, can still be attained. When the costs of control and transport are relatively insignificant, this may be an attractive option for many firms. In the Auckland context, however, where a large number of SMEs predominate, the dispersion of internal activities may be less viable for firms. Another response to increasing land pressures at a firm level would be to make changes to operational and management processes. A clear example would be a move to just-in-time (JIT) production, where significant savings on warehousing and storage costs can be made.

Looking at a particular national level driver of exit, it is plausible that higher costs brought about by an emissions trading scheme may hinder the competitiveness of the manufacturing sector in Auckland relative to cities and regions overseas²². The extent to which heavy emitting manufacturing firms are 1) footloose (for instance, to what extent will sunk costs, networking ties, and home market effects work against strong pull forces from other countries), 2) able to produce in different ways, and 3) a significant component of the economy, will, among other factors, determine the scheme's potential impact on the sector.

²² An emissions trading scheme has also been proposed in Australia recently (which, as a response, has generated similar anxieties related to the costs and impacts on businesses).

From the trends discussed in earlier sections, it is clear that manufacturing in many cities is suburbanising, or moving to the outlying areas of cities. In Auckland this may mean that manufacturing leaves Auckland city to settle in more peripheral areas of the region. Related to this however, is that we must be careful, given the economic ramifications, to distinguish between exit to other parts of the Auckland region from exit out of the Auckland region altogether.

Having outlined the many processes and counter-factors that will influence whether exit occurs or not, it still remains unclear as to how instruments within the district planning process could be used to achieve a stronger economy for Auckland city. In this sense, given the district plans bluntness, in terms of its inability to weed out poor performing firms while maintaining strong performers, devising a sound intervention logic would appear to be problematic.

7.1.2 Steady-State

A steady-state for manufacturing can occur at a range of levels. For instance, manufacturing output within Auckland city may stay constant, however, as experienced overseas, employment levels may significantly diminish. Alternatively, manufacturing employment may stay constant, but involve significant shifts in the nature of manufacturing activities that take place. For instance, firms that are cost-driven may be replaced (due to the imposition of high land and labour prices) by firms who are more value oriented, where production costs can be more readily absorbed. Given the wide ambit of manufacturing activities, there is likely to be sufficient scope for this to occur.

Also, when considering shifts in manufacturing, there are some important measurement issues which may conceal real activity that policy makers should be cognisant of. For instance, in the U.S., Government statistics tend to significantly undercount manufacturing activity. This occurs because manufacturing companies increasingly outsource service activities that they formerly performed in-house, such as accounting, payroll, design, R&D, and others. These activities are increasingly attributed to service industry sectors in the national statistics rather than to manufacturing²³. More than services are being outsourced, however. Houseman, Dey & Polivka (2006) find that U.S. manufacturing companies have also increasingly outsourced their “blue-collar” and production roles. They do this indirectly, through the use of temporary and leased workers (usually on-site) who are counted as employees of “employment services agencies.” Because of this assignment, the statistical counts of the work force of the companies that use employment services appear light, and declines in employment may be illusory, merely reflecting this outsourcing²⁴.

7.1.3 Acceleration

Whilst recent trends suggest that an acceleration of manufacturing activity is unlikely, shifts in global value chains that pass through Auckland might serve to reverse this trend.

Additionally:

- Auckland City, in conjunction with Auckland Plus, may have a key role to play in attracting investment in high-value manufacturing.
- The Auckland Innovation Centre will also be of crucial importance, as, at this site, the commercialisation of R&D can be effectively undertaken (analogous to the CRCs established in Sydney and Brisbane). For many manufacturing industries, which are increasingly innovation led, the AIC will have a critical role to play.

²³ <http://midwest.chicagofedblogs.org/archives/manufacturing/>

²⁴ <http://midwest.chicagofedblogs.org/archives/manufacturing/>

Acceleration in Auckland city must also be distinguished from acceleration in the rest of the Auckland region. Indeed manufacturing may provide a major opportunity for other territorial authorities to increase their economic and employment bases, in a manner that is consistent with underlying economic drivers and factors.

Finally, picking winners is a fraught process. In this regard, if we seek to intervene to further accelerate manufacturing, to what extent is creative destruction being disrupted? Moreover, by artificially propping up the sector, are we simply supporting inefficient activities?

8 Concluding Remarks

The future of manufacturing in Auckland city will be affected by a range of exogenous factors, beyond the control of Auckland City Council. Given this, along with the bluntness of the planning tools available to the Council, we suggest that it is very unclear as to whether interventions can be made through the planning framework to fashion a stronger Auckland economy (we have, however, pointed to a possible role for the AIC).

This paper shows that manufacturing is a large contributor to employment, value added, innovation, and has high exposure to the outside world and to new ideas. While firm turnover is lower than average, this should not be a cause for concern. Indeed, given the reforms of the 1980's we might expect that much of the shake-out has already occurred and those firms that are continuing will maintain their productivity performance. Nevertheless, we are witnessing decline in employment. The sector overall may be shrinking, but that may not be a bad thing.

Protection is an implicit or effective subsidy. Manufacturing used to have high levels of protection. It is interesting to note that the sector with the most protection (textiles, clothing, footwear and leather (TCF)) also had the biggest jump in R&D spending recently. However it is also the sector that shows the most signs of exiting. Protection now, often means pain is felt later.

Reallocation is happening within the industry in Auckland. Aspects such as machinery, TCF, metal product manufacturing, wood and paper and non-metallic mineral products are declining, while food, beverage and tobacco (FBT), and, to a certain extent, publishing printing and recorded media, are booming. In essence, markets appear to be doing their job.

It is trite to say that we should focus on higher value instead of routine manufacturing. That will tend to happen naturally. Also, the firm level is probably the best level to analyse things by. Fabling, Grimes, Sanderson & Stevens (2008) note, for instance, that labelling industries as “good” or “bad” may be misleading and counterproductive. There is significant heterogeneity within industries and even at the sub-industry level. Low average productivity industries always contain high performing firms and vice versa.

It is difficult to say what is the “optimal” level of manufacturing activity in Auckland. Comparisons with a selection of overseas cities suggest that we are not overburdened by manufacturing. Moreover, there are no obvious sectors that we could look to as a replacement. A large part of the services sector is devoted to domestic servicing and is transactions-based.

Whatever the optimal level is, we suggest that the market, through the process of creative destruction and firm dynamics is the best means of finding that. More study is needed, however, on locational choices, as it is not clear that firms will be comfortable moving from Auckland city to other parts of the region.

The pattern of manufacturing development has come about for a reason, perhaps due to the thickness of the labour market or because of urban infrastructure like airports, ports and roads. These advantages will remain. Nevertheless we may be heading for some kind of asymptote. Council needs to keep an eye on manufacturing's evolution, however, developing definitive “for” or “against” policies will be fraught.

Further to the analysis in the report, we consider the following questions to be noteworthy:

- To what extent does manufacturing have the capacity to take advantage of land spaces available in the city? For instance, with regard to large, brownfield plots (given the scale of investment required) are there manufacturing firms (or coalitions) in the market able to compete successfully? Could it be argued, for example, that large spaces are likely to be acquired by retailers simply because the market structure in retail is populated by large entities that can front up with the scale of investment required? In essence, economic outcomes might be divorced from which firms could actually be more competitive on the space, if acquired.
- At a policy level, what is emerging out of the regional centres classification work? Where does manufacturing fit relative to business services?
- To what extent are business and financial services more competitive? As raised in earlier sections, there is a strong body of evidence to show that manufacturing is at the forefront of technological progress and innovation. Additionally, given Auckland's role in the Australasian system of cities, what are the likely trajectories for the development of business and financial services in Auckland?

References

- Daniels, P.W. & Bryson, J.R. (2002) "Manufacturing Services and Servicing Manufacturing: Knowledge-based Cities and Changing Forms of Production", *Urban Studies*, 39, 977-991.
- Davis, D.R. & Weinstein, D.E. (1999) "Economic Geography and regional production structure: An empirical investigation", *European Economic Review*, 43, 379-407.
- Dinlersoz, E. (2002) "Cities and the Organization of Manufacturing", Urban/Regional 0204003, EconWPA.
- Duranton, G. & Puga, D. (2005) "From sectoral to functional urban specialisation", *Journal of Urban Economics*, 57 (2) 343-370.
- Fabling, R., Grimes, A., Sanderson, L. & Stevens, P. (2008) "Some Rise by Sin, and Some by Virtue Fall: Firm Dynamics, Market Structure and Performance", MED Occasional Paper 08/01. Available at: www.med.govt.nz/templates/MultipageDocumentTOC_34197.aspx, accessed 3 July 2008
- Graham, D.J. & Spence, N. (1995) "Deindustrialisation and tertiarisation in the London economy", *Urban Studies*, 32 (6), 885-991.
- Haltiwanger, J. (2002) "Understanding aggregate growth: The need for microeconomic evidence", *New Zealand Economic Papers*, 36 (1), 33-58.
- Henderson, J.V. & Ono, Y. (2008) "Where do manufacturing firms locate their headquarters?", *Journal of Urban Economics*, 63 (2), 431-450.
- High Level Group on Manufacturing in Ireland (2008) "The report of the high level group on manufacturing in Ireland", available at: www.forfas.ie/publications/show/pub295.html, accessed 1 July 2008.
- Houseman, S., Dey, M. & Polivka, A. (2006) "Manufacturers' Outsourcing to Employment Services", Upjohn Institute Staff Working Paper No. 07-132. Available at: http://papers.ssrn.com/sol3/papers.cfm?abstract_id=959428, accessed July 3 2008.
- Krugman, P. (1980) "Scale Economies, Product Differentiation, and the Pattern of Trade", *American Economic Review*, 70 (5), 950-59.
- Kuncoro, A. Henderson, J.V. & Turner, M. (1995) "Industrial Development in Cities", NBER Working Paper No. W4178.
- Lattimore, R. (2003) "Long Run Trends in New Zealand Industry Assistance", Motu Working Paper 03-11. Available at: http://motu-www.motu.org.nz/wpapers/03_11.pdf, accessed 13 June 2008.
- Law, D. & McLellan, N. (2005) "The Contributions from Firm Entry, Exit and Continuation to Labour Productivity Growth in New Zealand," Treasury Working Paper Series 05/01.
- Lee, Y. (2007) "Geographic Redistribution of the U.S. Manufacturing and the Role of State Development Policy", Federal Reserve Bank of Cleveland Working Paper No. 04-15.

Leibowitz, S.J. & Margolis, S.E. (1995) "Path Dependence, Lock-in and History", *Journal of Law, Economics and Organization*, 11 (1), 205-226.

Maré, D. & Timmins, J. (2006) 'Geographic concentration and firm productivity', Motu Working Paper 06-08.

Marshall, A. (1920) *Principles of Economics*, London: Macmillan.

McMillan, J. (2004) "Quantifying Creative Destruction. Entrepreneurship and Productivity in New Zealand", Motu Working Paper 04-07.

Pilat, D., Cimper, A., Olsen, K.B. & Webb, C. (2006) "The Changing Nature of Manufacturing in OECD Economies", OECD Science, Technology and Industry Working Papers, No. 2006/9.

Rosenthal, S.S. & Strange, W.C. (2004) "Evidence on the Nature and Sources of Agglomeration Economies", In Henderson, J.V. & Thisse, J.-F. (Eds) *Handbook of Urban and Regional Economics*.

Saxenian, A.L. (1994) *Regional Advantage: Culture and Competition in Silicon Valley and Route 128*, Cambridge, MA: Harvard University Press.

SGS Economics and Planning (2004) "Sydney's Economic Geography: Trends and Drivers", June. Available at:
www.metrostrategy.nsw.gov.au/dev/digitalAssets/435_1087439419590_924eea%20_summary_JUNE2004.pdf, accessed 3 July 2008

Ulku, H. (2008) "R&D, innovation, and growth: evidence from four manufacturing sectors in OECD countries", *Oxford Economic Papers*, 59 (3), 513-535.

Walton, M. (2006) "The University of Auckland - Economic contribution to the Auckland Region", April. Available at:
<http://www.auckland.ac.nz/uoa/fms/default/uoa/about/uoa/plans/docs/Economicimpact2006.pdf>, accessed July 1 2008