Residential construction and costs

Author: Ian Page, Manager Economics

Presenter: Pieter Burghout, CEO

BRANZ

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Summary

This study examined the cost structure of new housing and some performance aspects on the residential construction sector. The main findings were:

- The cost of a section is a major part of typical new house package at about 43% of total cost in the urban centres. The bare land was about 25% of the cost, and the remaining 18% included developers profit, professional fees and council charges.
- After land the next biggest cost component is building materials, at about 29% of the total package.
- Material manufacturing is not generally on a world scale in New Zealand so that the unit cost for most materials is higher than overseas. The distributed nature of the local market further reduces the manufacturing scale since two or more plants appear to be more economic than a single large scale plant, for many materials, due to transport cost considerations.
- A survey of new house owners showed that provision of a double garage was a top priority in the design. Other findings of the survey indicated new owners gave priority to detached suburban living with a commute, rather than medium density housing nearer work.
- Group builders specialising in a fairly narrow range of new housing are able to build approximately 15% cheaper than for one-off designs of a similar quality.
- Medium density multi-unit construction costs are typically about 10% more expensive than new detached houses.
- Industry productivity has declined in recent years and the reasons for this are not clearly understood.
- The residential construction firm is typically small in size, with over 70% of residential sector employment in firms with a size of 6 or fewer staff.

The implications for the industry looking ahead are:

- Bare land costs need to be controlled in some fashion and/or more land released to meet demand from potential owners for new housing, as required.
- Designers need to better understand what owners require from their new homes in terms of amenity.
- Households are not yet generally convinced of the merits of medium density housing within existing urban limits.
- Standardising on designs and components, and persuading owners to select within a limited design range, will enable significant cost savings.
- The residential construction sector needs to scale up in firm size to be able to more effectively construct the increasing proportion of medium density housing expected in the future.

New house price composition

The cost components of new housing are shown in Figure 1. The largest single component is the land cost, followed by materials and labour costs.

Figure 1 New house price composition.

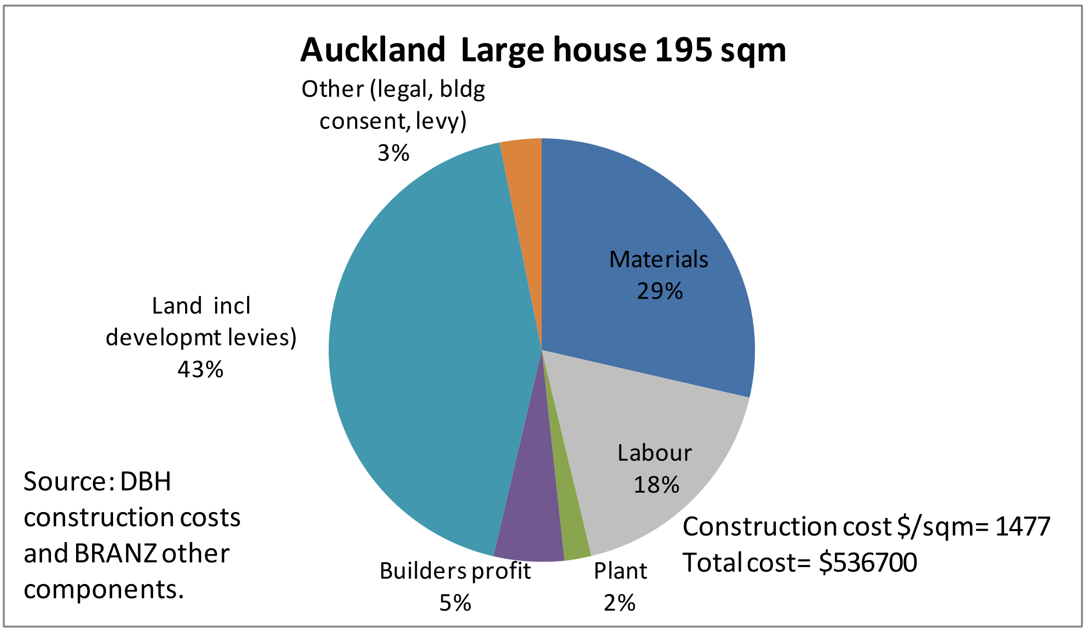


Figure 2 shows how land and building costs have changed with time. Since 1992 section prices have escalated by about 500% compared to building costs by 200%, and sections have become a larger part of the package, see Figure 3.

Figure 2 Cost changes of segments

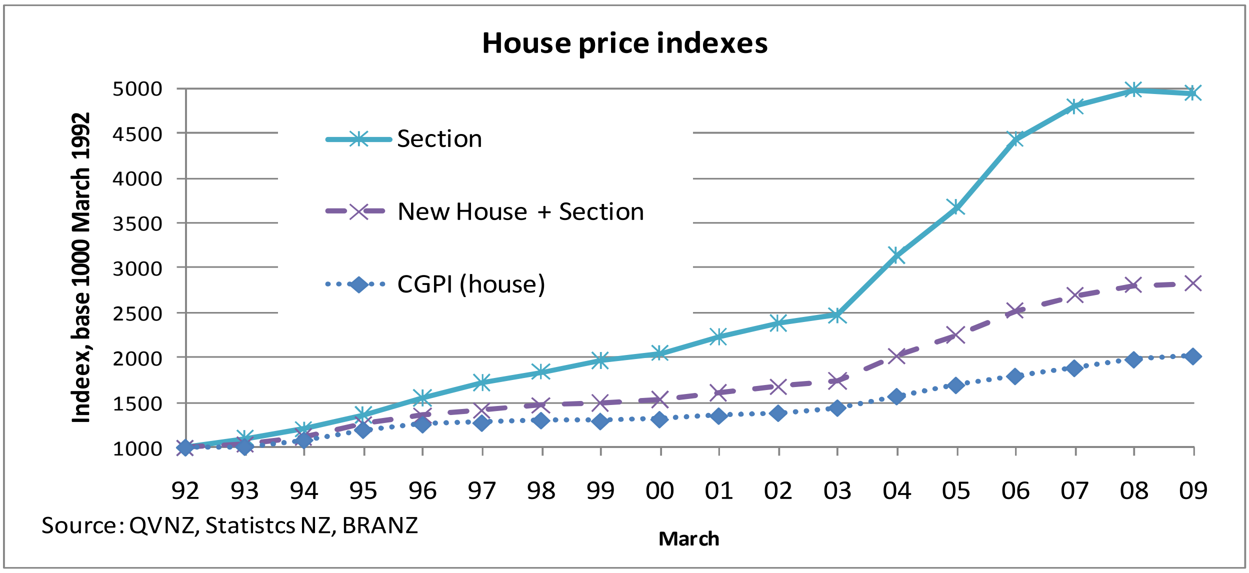


Figure 3 Average section prices

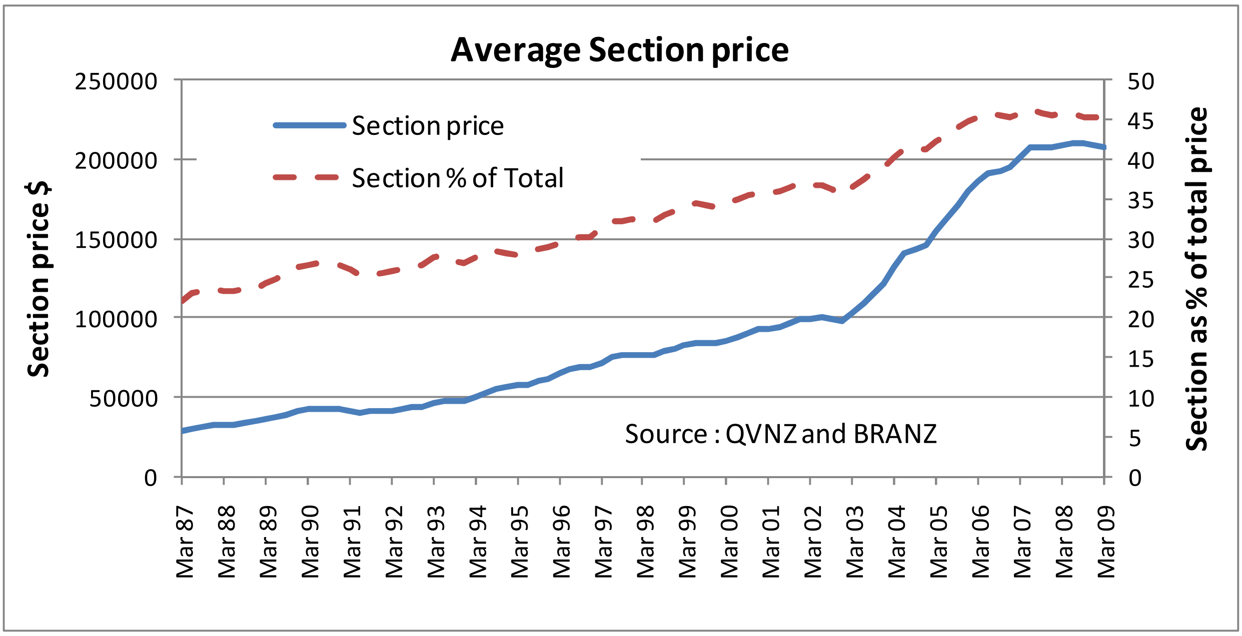
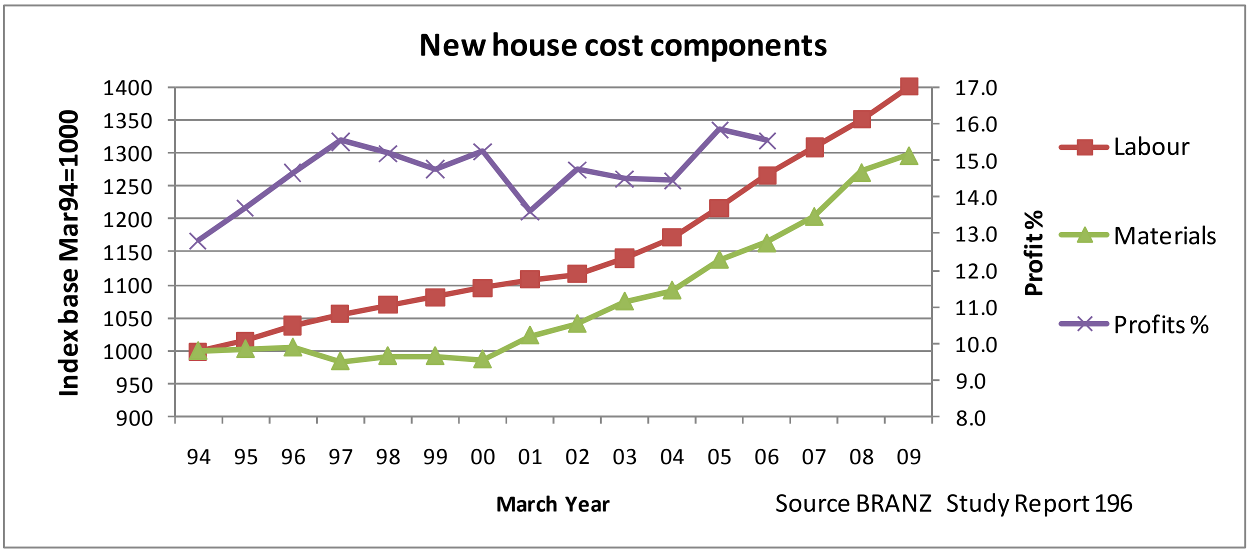


Figure 4 House building components

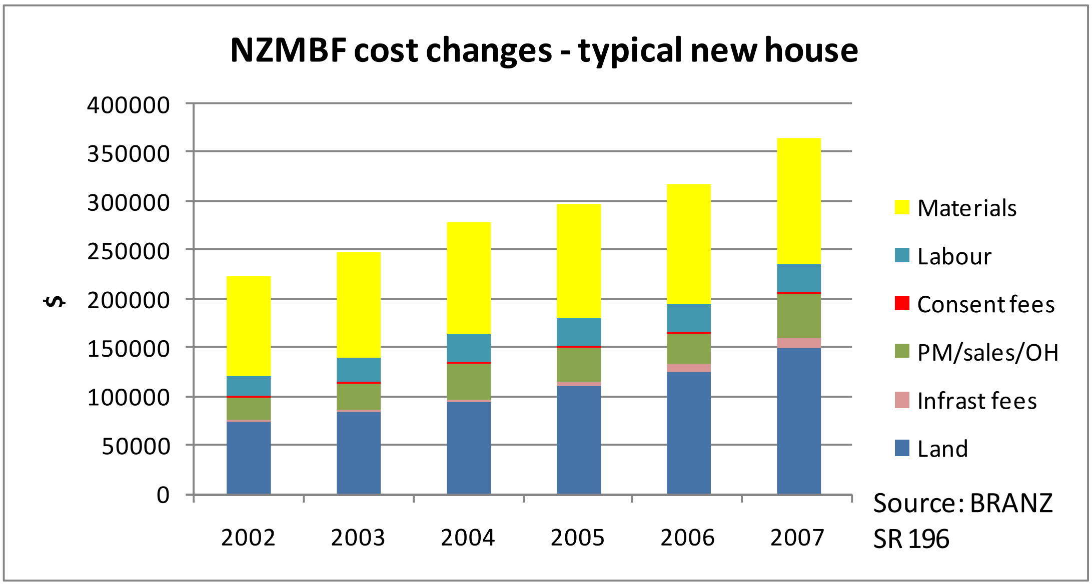


The material index was developed by BRANZ as described in the study report, and is a weighted composite index for various materials monitored by Statistics NZ.

The NZ Master Builders Federation monitored cost changes in recent years for the construction of a typical house, see Figure 5. They recorded an increase of about 63% in the five years to 2007. This is similar to the 61% increase recorded in

Figure 2 over the same period for the section and house. Infrastructure fees rose from about $1,000 in 2002 to about $10,000 in 2007 and project management and overheads rose from $24,000 to $44,000 per house.

Figure 5 Cost changes in house building as monitored by NZ Master Builders.



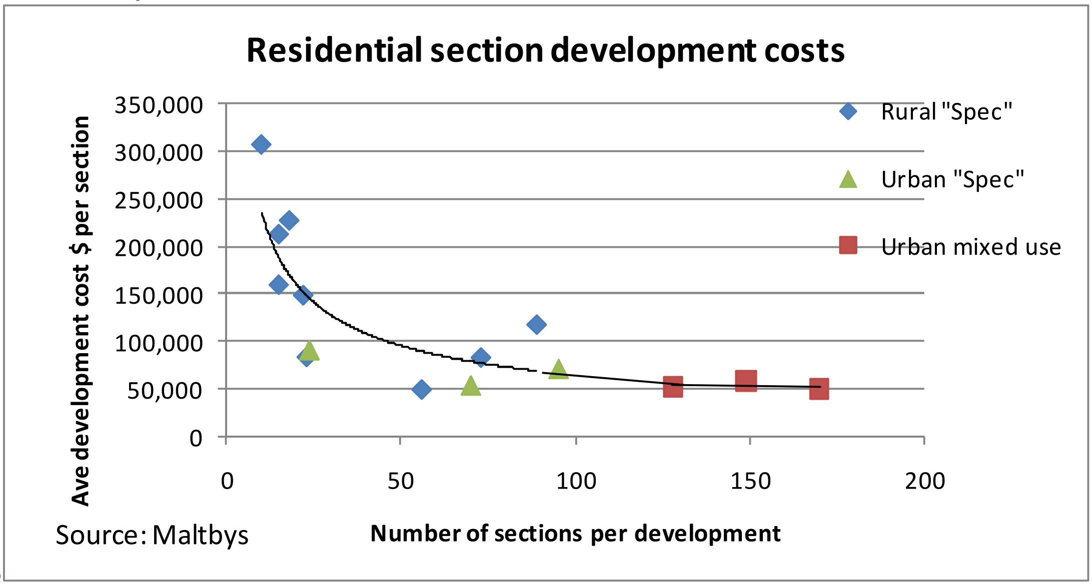
From the above it is apparent that the land price is the component contributing most to new housing price escalation in recent years. The next section examines the composition of land costs.

Land development costs

The cost of developing land depends on the scale of the development and whether the development is adjacent to existing services, sees Figure 6. The costs exclude the bare land cost and developer's profit. For urban development the average development cost was about $56,000 per section, consisting of infrastructure $37,000, professional fees $10,000, council charges and fees $7,000, time related costs $1,000 and contingencies $1,000, see Figure 7. This is a for a sample of approximately 600 sections in six developments in North Shore, Hawkes Bay, Wellington, Queenstown and Southland.

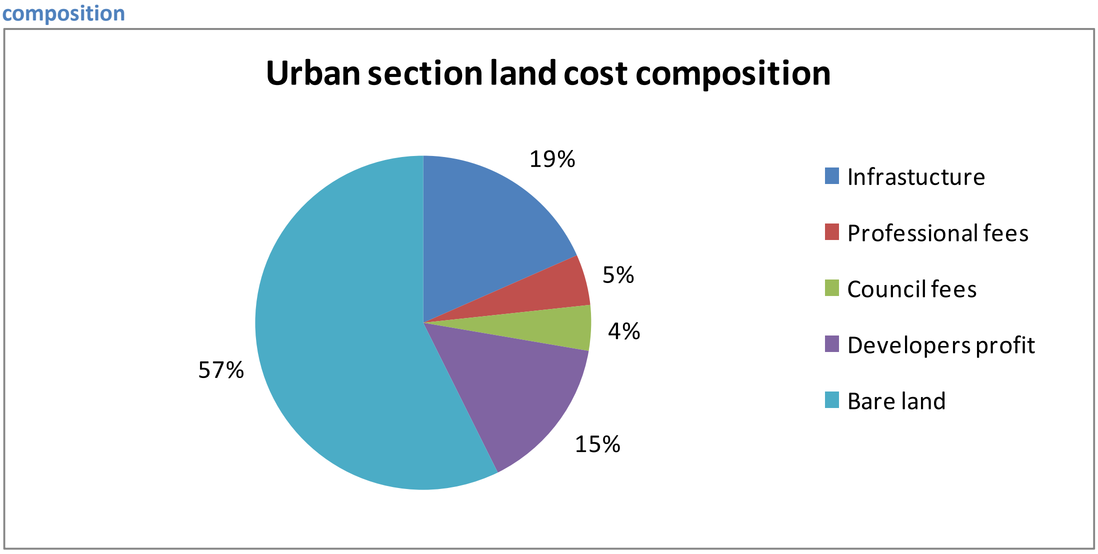
Urban bare land costs are between $60,000-$150,000 per section (500sqm lot) within urban limits, and developer's profit about $30,000 per section, so the total section price is about $200,000 in the main urban areas, though prices vary somewhat by location.

Figure 6 Land development costs



sample

Figure 7 Urban land cost composition



The bare land cost is about 57% of the total section price, and from Figure 1 this indicates the bare land is about 25% of the total section and house package for a typical new house. This percentage will vary somewhat depending on the location and house type. The Council fees in the sample were a low percentage of total costs.

Materials manufacturing

Next to the land cost the biggest component of new housing is the materials cost. For many materials there are only one or two manufacturers within New Zealand, and this lack of competition may be influencing prices. Much of the reason for the limited number of manufacturers is the manufacturing scale required for many building materials. Only some of the manufacturing plants in New Zealand are on a world scale, see

Table 1. The fact that local demand is less than world scale need not adversely affect prices if the product is competitive on the world market (or in Australia only), as the surplus is exported and the local users can in theory benefit from the economies of scale.

Some product prices are likely to be higher than world average. For example, clay brick demand is below world scale and we import from Australia, as well as making some locally, so unit costs are higher than in Australia. We have two cement plants each at about 700,000 tonnes per year, which is well below the size of the newest plants in a number of countries. Note however, world scale refers only to the unit cost of manufacturing, and when transportation of bulky products like building materials is considered, it may be more cost effective to have smaller plants located closer to the main markets. That seems to be the case for cement manufacturing in New Zealand where the two plants (Whangarei, West Coast) are widely separated and each are believed to have the major market share in their respective hinterlands. However both manufacturers have a presence in most regions across NZ even though transport costs are likely to be excessive for some locations. This type of market behaviour is why material unit costs in a small distributed market like New Zealand are often higher than in large concentrated markets overseas.

Table 1 Building materials scale economics

Scale economies in building material manufacturing plant

Industry	World scale plant output volumes/ year (1)		NZ Production (5)		Number of NZ plants	NZ new building demand (6)	
Softwood milling	150,000	cum	4,506,000	cum	300+	1,200,000	cum
MDF	170,000	cum	766,000	cum	3	?	
Particleboard	200,000	cum	253,000	cum	2	20,000	cum
Softwood ply sheet	100,000	cum	428,000	cum	2	5,000	cum
LVL	80,000	cum	254000	cum	1		
Clay bricks (2)	5M	sqm			2	1,700,000	sqm
Plasterboard (3)	20M	sqm			2	25,000,000	sqm
Cement (4)	0.5 to 1.5 M	tonnes			2	1.5 million	tonnes
Steel making	1.0 to 1.5 M	tonnes	0.8M	tonnes	1	0.1M	tonnes

(1) Source for all timber based products : http://www.plantationsnortheast.com.au/origin.htm

(2) Morton, Jaggar (1995) Design and the economics of building. Taylor and Francis.

(3) European Commission. Commission Decision 89/22/EEC, Dec 1988.

(4) The Economic and Technical Viability of Various Scales of Building Materials Production (HABITAT, 1989) United Nations Centre for Human Settlement.

(5) NZ production of forestry products from Ministry of Agriculture and Forestry.

(6) BRANZ estimate of NZ demand in 2007.

Labour costs

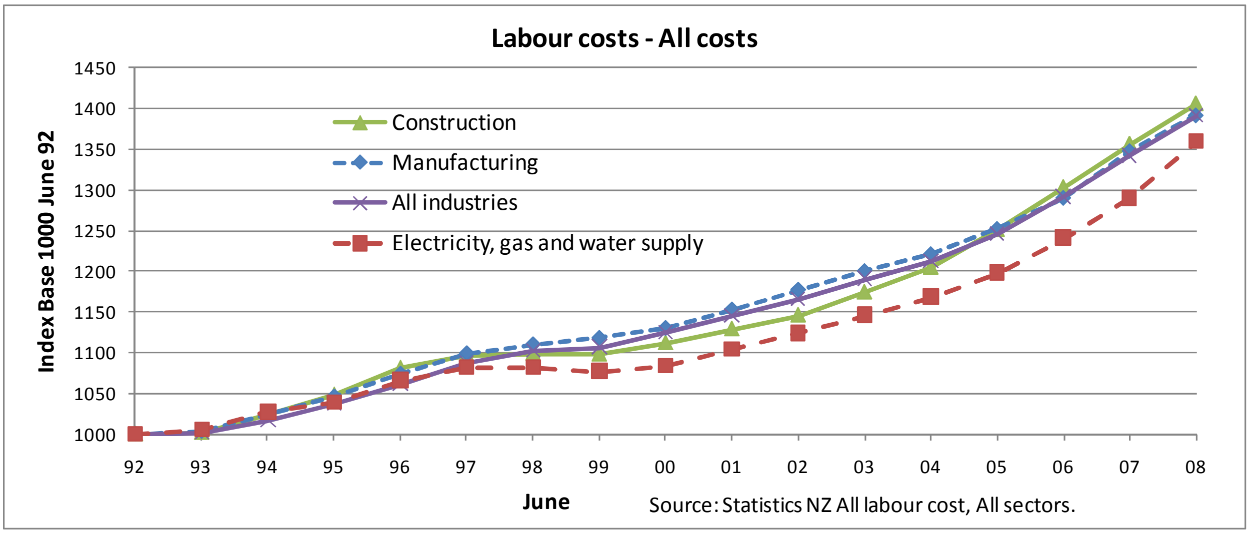
Construction labour cost escalation is compared to other industries in

Figure 8. The indexes are for all costs and include overtime, loans, superannuation and ACC levies as well as the basic wage/salary cost.

The escalation since 1992 is almost the same for all industries, though since 2002 construction industry costs have risen faster than other industries, by about 3% more compared to the all industry index. This reflects increased demand over the period and more overtime in the industry.

Some construction skills are transferable between manufacturing and the electricity, gas and water industries so these indexes are included for comparison. However the main conclusion is that construction industry labour cost escalation is similar to that in other industries in the long-run.

Figure 8 Construction labour cost trends compared to other industries



Typical new house trends

Compared to the 1970s new housing is today typically more complex. Modern houses tend to have multiple cladding types, complex roofs and wall intersections, parapets and balustrades, decks over living spaces, etc. For example, compare Figure 9 with

Figure 10.

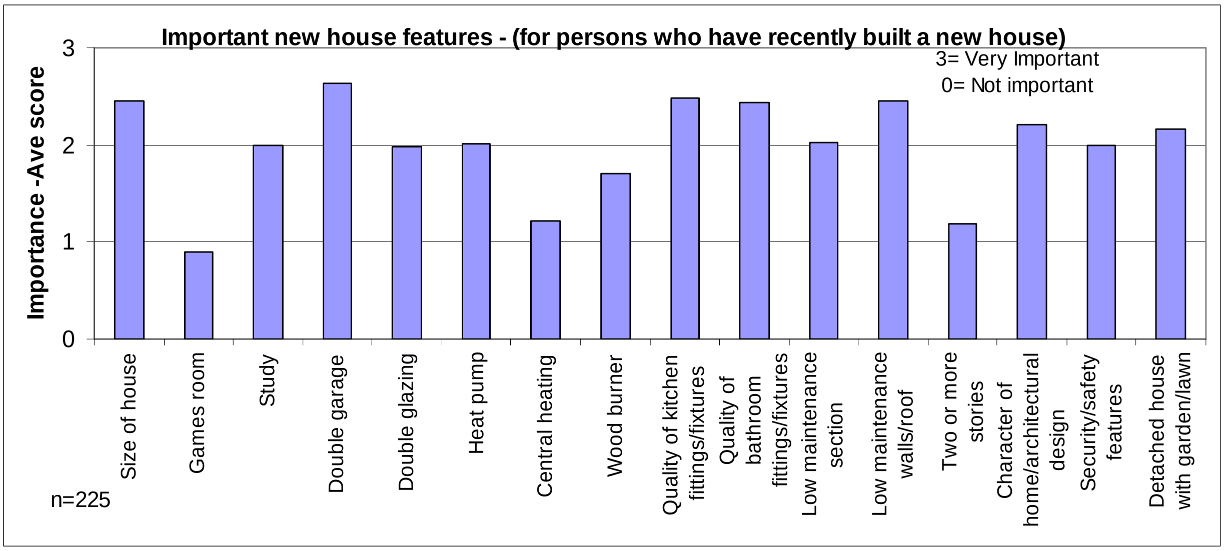
Figure 9 Typical 1970s house

Figure 10 Typical modern house

What new home buyers want

New home buyers were surveyed in 2007 by BRANZ, (Page 2007) on their attitudes to their new home and the factors that decided them on the particular purchase. The provision of a double garage was top priority followed by the quality of the bathroom and kitchen fittings and finishes. Owners were aware of maintenance implications and low maintenance wall and roof claddings also scored high. Owners also required as much floor space as possible given their budget constraint, see Figure 11.

Figure 11 Important features for new housing owners



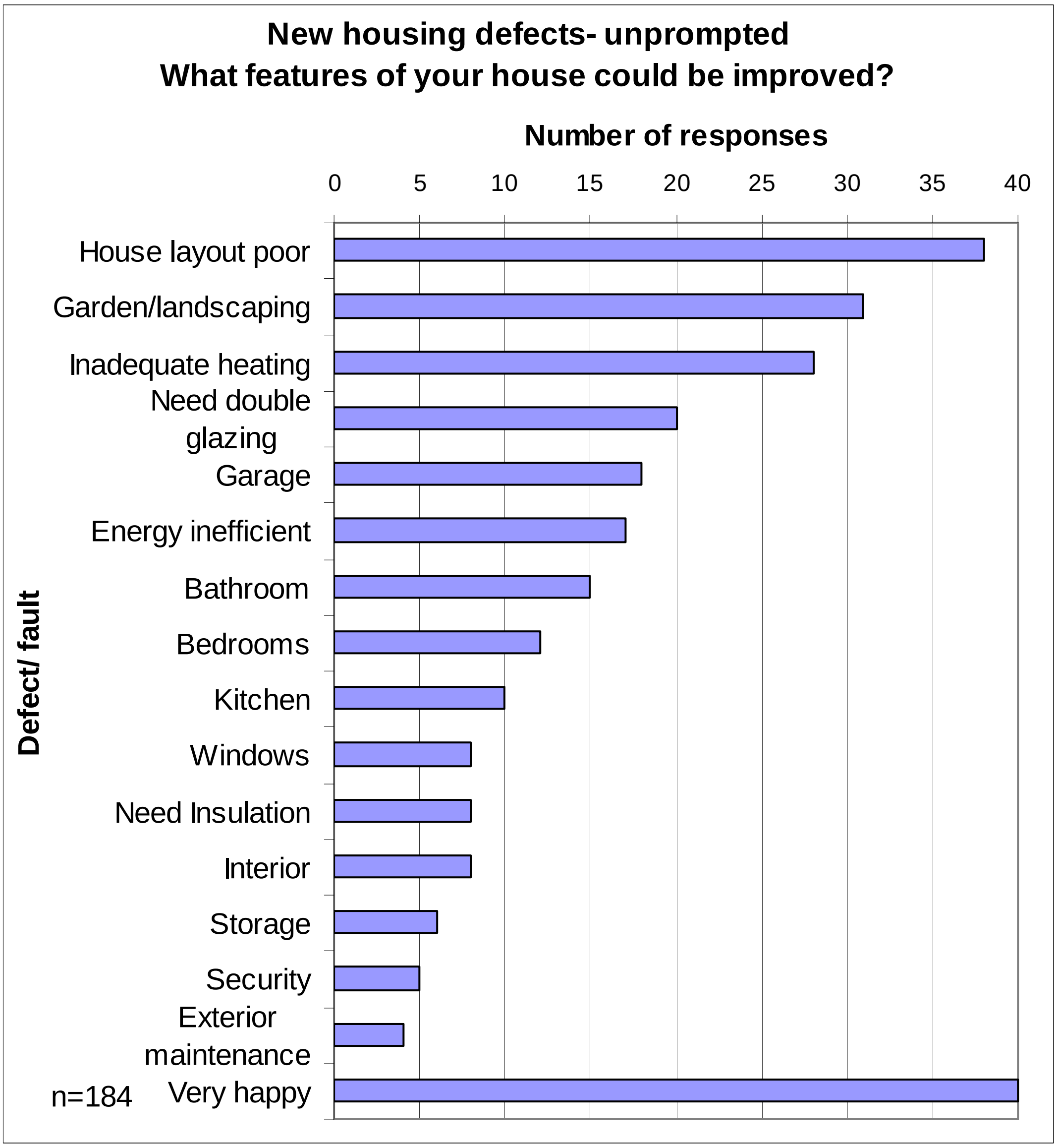
Owners were also asked about defects in their house, see Figure 12. The top complaint was that the layout was poor, which covered a number of comments including the rooms were too small, the relationship between spaces was not good, transition from outside into the house was poor, orientation on the site and for the sun was not optimal, etc. The inference is that despite the increase in new housing floor areas the designs are not well thought out. The average number of bedrooms was 3.7 per house in the sample and given the decreasing family size it is a puzzle why households believe they need so much floor space. In terms of layout the design could be improved in many cases with fewer bedrooms and larger living and transition spaces.

Another finding from Figure 12 is the number of items relating to "thermal comfort". Many new owners had not achieved the expected level of comfort, as evident by the comments on inadequate heating, double glazing, energy inefficiency and the need for more insulation. About 15% of respondents to the survey had this complaint which is quite a high percentage for what is a basic amenity of a new house.

The comment on landscaping occurred often and probably means the owner's budget did not allow this to be done immediately and they have not yet got round to improving the landscape themselves.

A significant number offered the comment they were happy with their new home.

Figure 12 Owners opinions of defects in new

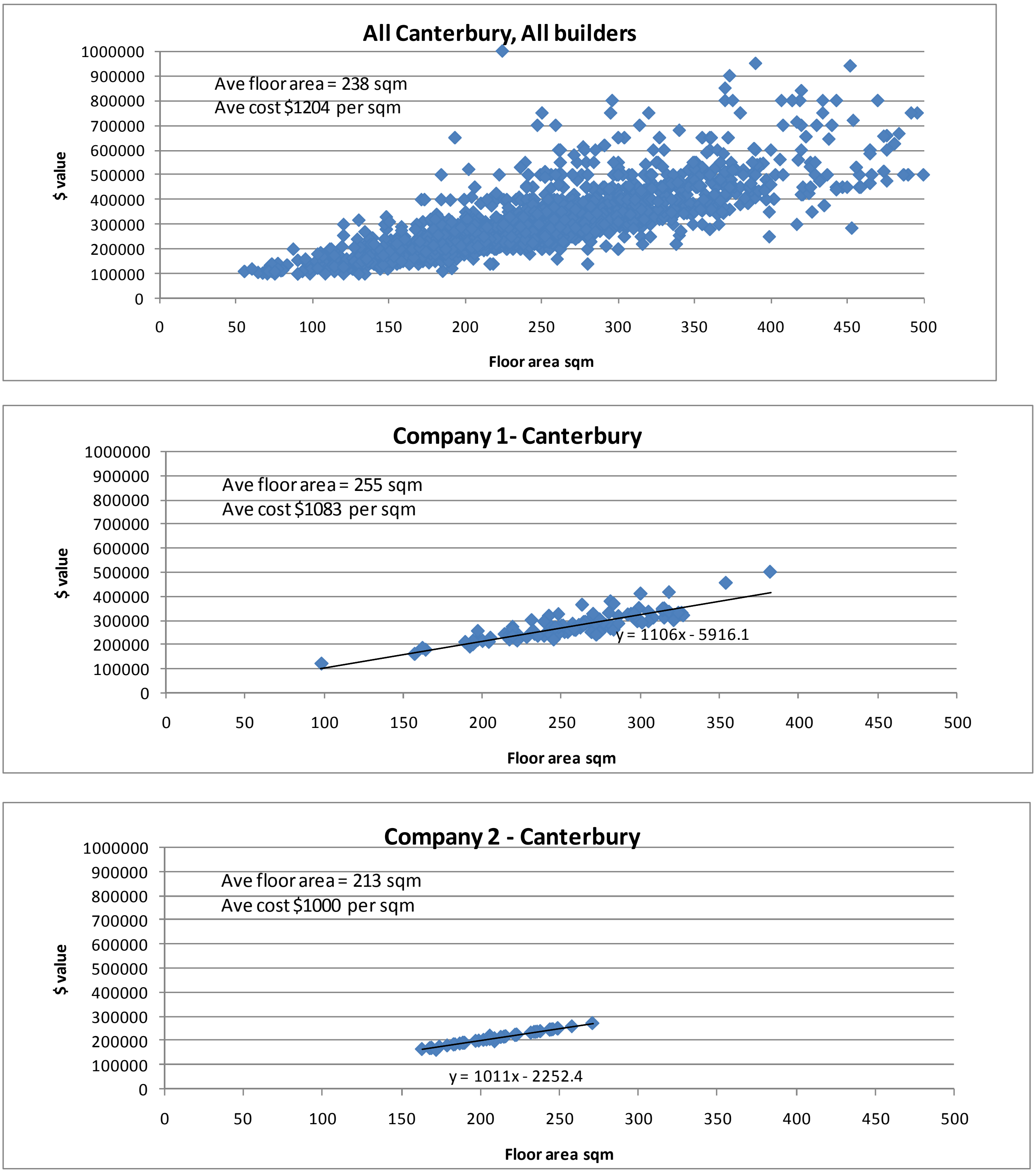


houses

Types of builders

Builders tend to specialise in different segments of the market. An examination of new house building consent in a particular location demonstrates this. Figure 13 shows new house consents for Canterbury in 2007 and the lower panels are for two volume builders Company 1 and 2.

Figure 13 Canterbury building consents by builder



The top panel shows all builders and the lower two show builders that specialise in a particular segment. Company 1 builds a range of sizes, from 100 sqm to 380 sqm but concentrates on the larger houses over 200 sqm in floor area. Company 2 offers a narrower range between 170 to 270 sqm. The latter has the lowest average cost at $1,000 per sqm and Company 1 a bit higher at $1083 per sqm. It is noteworthy that both have a lower average cost than all builders in Canterbury. Many of the other builders will be quite small scale and the houses are likely to be mainly one-off designs.

Study Report 196 examines other companies and other regions. The analysis in the study report leads to the following conclusions:

- The major builders targeting the lower cost end of the market provide housing at between 4% and 20% cheaper than the other general builder in their regions and they average around 15% cheaper.
- Some national builders target higher cost segments and achieve regional average or above average prices for their houses.
- The lowest cost major builders have thought to offer only a limited range of homes, based on the narrow range of floor areas they provide, and their unit cost ($/sqm) is fairly constant across the floor area range.

Multi-unit construction costs

Forecasts are for multi-units to increase as a proportion of new dwelling construction (DTZ New Zealand (2007). Table 2 shows recent costs for multi-units, from building consent data. For horizontally attached units (i.e. a wall in common between adjacent occupancies) the cost in $ per sq metre of floor area is about the same or slightly less than that for detached houses. However, for vertically attached units (i.e. a floor-ceiling in common) the multi-unit cost is about 10% more expensive in the 10 to 25 unit range which covers the medium density developments expected in the future.

Work by BRANZ has found a similar 10% cost increase for two storey detached houses, compared to single storey detached housing. (Page 2008). As section sizes become smaller detached housing is increasingly having an upper storey and impacting on unit costs.

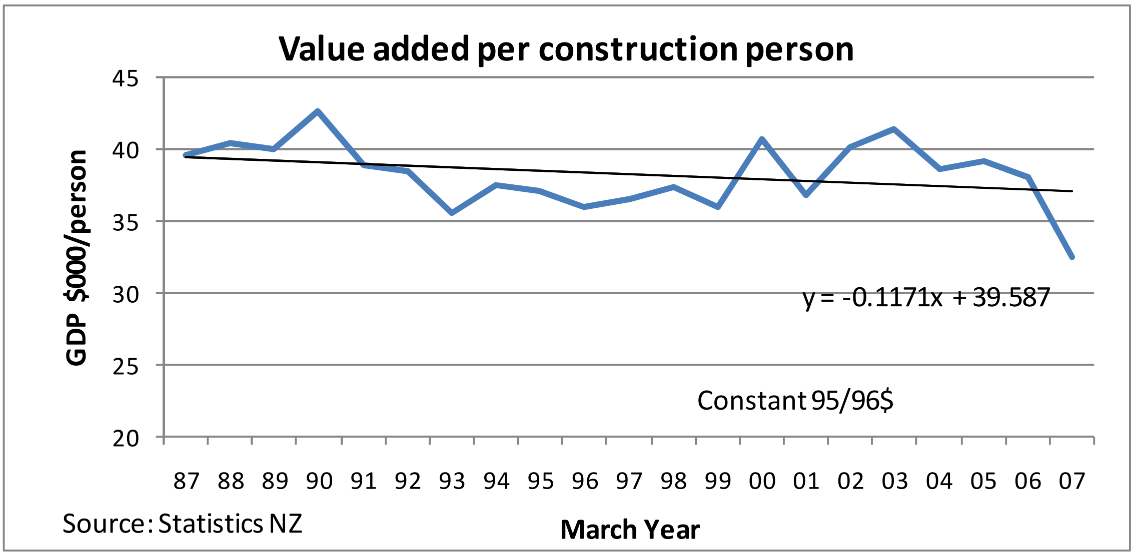
Table 2 Multi-unit building costs

Multi-unit building consents					
	Number of consents		$ per sqm floor area		
	Horizontally attached	Vertically attached	Horizontally attached	Vertically attached	Detached house only
	Year ending Dec 2006				
#units per consent					
1 to 6 units	1,016	100	1171	1346	
7 to 9 units	31	15	1458	1529	
10 to 15 units	0	38		1341	
16 to 25 units	0	40		1301	
>25 units	0	35		1315	
Total			1204	1330	
Detached houses only					1171
	Year ending Dec 2007				
#units per consent					
1 to 6 units	1,057	129	1230	1423	
7 to 9 units	27	10	1140	1056	
10 to 15 units	0	43		1388	
16 to 25 units	0	33		1437	
>25 units	0	22		1762	
Total			1222	1521	
Detached houses only					1245
	Year ending Dec 2008				
#units per consent					
1 to 6 units	841	80	1170	1102	
7 to 9 units	20	2	1250	2410	
10 to 15 units	0	20		1442	
16 to 25 units	0	13		1453	
>25 units	0	27		1432	
Total	861	142	1185	1536	
Detached houses only					1331

Productivity

There are various measures of productive and the simplest is to measure industry output per number of workers. This is shown in **Error! Reference source not found.**, where the value added is the industry contribution (buildings and civil engineering) to total GDP, so it excludes inputs such as materials from other industries. Value added is in constant 95/96 $ terms so the chart indicates a slight downward trend in productivity of about 0.3% pa. In comparison, the whole economy number was about $45,000 per person for the 2000 to 2004 period.

Figure 14 Value added per construction worker

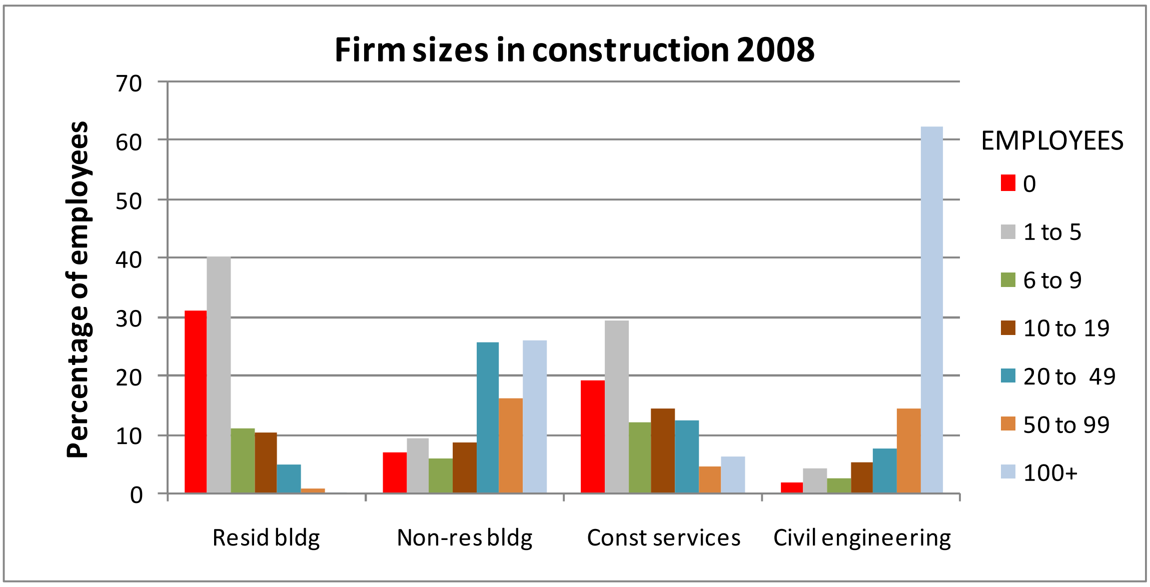


The downward trend is slight, and the yearly fluctuations are quite large, so the trend depends to some extent on what period is chosen. For example, a Treasury paper (Jansen, McLoughlin 2008) found construction industry labour productivity declining by about 0.5% per year in the 7 years to 2007. The trend is influenced by changes in use of plant and equipment, and changes in management efficiency (e.g. organisation of sub-contractors), in which case the apparent decline in labour productivity could be misleading. A Cobb-Douglas analysis (Page 2008) which allows for changing capital and technical changes in the industry suggests that management/ technical efficiency has declined, possibly due to workload pressures, and more onerous inspection, health and safety regimes. More work is required in this area.

Firm size

Data from the Statistics NZ business demographic survey indicates the number of employees per firm in the construction industry is quite small, particularly in the residential sector. This has implications for the industry as the type of new dwelling changes from detached to medium density in the future.

Figure 15 Construction industry firm sizes



References

DTZ New Zealand (2007) Census 2006 and housing in New Zealand. CHRANZ and Building Research. Downloadable from CHRANZ website www.chranz.co.nz.

Janssen J, McLoughlin S (2008) *New Zealand's productivity performance*. NZ Treasury Productivity Paper 08/02.

Page, I. 2007. Changing housing need. BRANZ Study Report 183. BRANZ, Wellington. Downloadable from BRANZ website www.branz.co.nz

Page, I. 2008. New House Price modeling. BRANZ Study Report 196. BRANZ, Wellington. Downloadable from BRANZ website www.branz.co.nz