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Up or out? Residential building height regulations in Auckland - understanding the effects and implications

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Up or out? Residential building height regulations in Auckland - understanding the effects and implications

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Disclaimer

This working paper shows preliminary analysis and is presented to the 2014 New Zealand Association of Economists conference to stimulate discussion and critical comment. This working paper contains analysis which is subject to a review process and should not be relied upon in any way until issued as final. The analysis and opinions expressed in this report are the author's own and do not necessarily reflect, and should not be reported as, the view of Auckland Council.

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1.0 Introduction

Interest in Auckland's housing market is greater than ever. Recent headlines such as "*House prices rise $100 a day*"[1], "*Asking price for homes at record levels*"[2] and "*House values soar in tight Auckland property market*"[3] attracts discussion from homeowners, would-be homeowners and policymakers. Auckland policymakers are interested in Auckland's housing market and housing affordability in the context of becoming the world's most liveable city and the Auckland Plan.

There is widespread acknowledgement that there is a shortage of housing in Auckland which has contributed in part to the rapid price appreciation observed over the last few years. Consenting levels have been low, relative to population growth which has resulted in a shortage of housing. There is no consensus on the exact figure of the shortage, but it is likely to be somewhere between one and two years' worth of supply, at current levels of consenting activity.

Agreeing to policy tools to increase the supply of housing is also less clear cut.

Some argue that Auckland Council should release more land for residential development to ease supply constraints and reduce the pressure on prices, pointing to studies by Grimes and Liang (2007) and Zheng (2013), which indicate that the Metropolitan Urban Limit has put upward pressure on land prices within urban areas. This is one option that would make more land at the urban periphery available to developers.

An alternative and complementary option is to increase the supply of housing units by building up. This is an area which, up until recently, has not been a focus of New Zealand policy and economic research circles. Unlike expanding the urban limit, increasing supply by building up means developers are not limited to land geographically remote from the CBD, centres of employment or urban amenities.

This paper aims to contribute to the evidence base on the effect of building height regulations in Auckland. First, it outlines the current height restrictions in Auckland and reviews the literature on the effects of building height restrictions. There is a reasonable body of work on estimating the costs but less literature quantifying the benefits of building height restrictions. Second, it sets out the method developed by Glaeser et al (2005) to estimate the effects of regulations that restrict the supply of housing units vertically. Third, it attempts to employ the method developed by Glaeser et al (2005) with Auckland data. Last, the paper concludes with potential areas for further work and policy considerations.

[1] NZHerald 14 June 2014

[2] NZHerald 13 June 2014

[3] NZHerald 11 June 2014

2.0 Background information

2.1 Current height restrictions and the Proposed Auckland Unitary Plan

Height restrictions are often misunderstood. As a control in Auckland, height restrictions have restricted discretionary status. This means that in an area with a height restriction of 12m (and no other relevant controls), a developer could build up to 12m without notification. Importantly, the developer could seek permission to build even higher, through the costly and time consuming building consent process, but there is no guarantee of success.

Box 1: The Proposed Auckland Unitary Plan (PAUP)

Auckland currently operates under four regional and seven district plans and one regional policy statement. These planning documents were developed when Auckland was made up of Auckland Regional, Auckland City, Franklin District, Manukau City, North Shore City, Papakura District, Rodney District and Waitakere City councils.

From 1 November 2010, the Auckland Council became a unitary authority through the amalgamation of the regional council and seven territorial authorities. The PAUP will be the first planning rulebook for Auckland Council.

The Auckland Regional Policy Statement, four regional plans and seven district plans will continue to be operative until the PAUP takes effect. The PAUP is currently notified but not operational - the process to deliver the first combined plan for Auckland Council will take place over the next three years.

Under the current operative plans in Auckland, height restrictions range from as little as 8m tall to unlimited in some areas. Additional restrictions on density, view protection planes and special character overlays also influence building height. Building height regulations, view protection planes and density constraints all influence the shape of Auckland's skyline.

The PAUP aims to ensure Auckland's growth is balanced with maintaining the characteristics of an area. The height restrictions in the PAUP have been developed with certain principles at the forefront, including taking into account the status of the centre/area in the Auckland Plan hierarchy, public transport and future transport projects, current building heights, landscape features, historic heritage, among other principles.[4]

[4] Refer to *Auckland's centres: building heights/Proposed Auckland Unitary Plan: Fact Sheet* available here: http://www.aucklandcouncil.govt.nz/EN/planspoliciesprojects/plansstrategies/unitaryplan/Documents/Key%20topics%20in%20detail/upkeytopicsbuildingheights.pdf

The PAUP, as it currently stands, increases height limits in some areas, while in many others, does not change the height limit. It also imposes a height limit in some areas, where there is no current limit in place (for example, parts of Manukau and Henderson currently have an unlimited height limit).

A consultative process was adopted when preparing the PAUP. A draft Unitary Plan was released for public consultation in March 2013, after which amendments were made and incorporated into the PAUP. Following feedback from the community, some height limits were reduced from the March 2013 draft Unitary Plan, a few were increased.

See Appendix B for a summary of the change in height controls across Auckland in the PAUP, along with the changes from the draft Unitary Plan.

2.2 Literature review – effects of residential building height regulations

There is a growing body of literature investigating the effects of land use regulations, analysing a wide range of city planning and land use issues. This literature review has limited its scope to the studies which have sought to quantitatively analyse the effects of residential building height regulations, which is the aim of this study. The literature favours quantitative analysis of the costs of building height regulations, an easier task than quantitative analysis of the benefits of building height regulations. As such, the positive effects of imposing residential building height regulations are outlined below for completeness, but are not the focus of the literature review.

In city planning, building heights can be regulated in many different ways. Heights can be controlled directly by designating a maximum number of storeys (e.g. 4 storeys) or meters for a building (e.g. 12 meters). Building heights can also be controlled by floor area ratio maximums (e.g. 4). The floor area ratio (FAR) is the ratio of the total floor area of the building to the size of the lot (and is measured across multiple units on a single site). The wider literature regards the floor area ratio as tool to regulate heights as well as site intensity and density, but in the literature reviewed for this study, any application of floor area ratios has been regarded as a tool for restricting height, rather than intensity or density. Finally, sightlines and view protection planes are also used to regulate heights. This literature review has not differentiated between the tools for regulating height.

2.2.1 Benefits

This literature review starts with an assessment of the benefits of building height regulations. Anecdotal evidence from conversations with city planners suggests that the major benefit of residential building height regulations is certainty. It is proposed that imposing building height regulations provides certainty to existing residents that buildings in their neighbourhoods will not likely exceed a certain height.[5] This is a private benefit accruing to residents of an existing neighbourhood (that is, close enough to be affected by the building height regulation).

Turning to the literature, the reported benefits of building height regulations are stated below in Table 2-1. The benefits are also categorised as a private or social benefit. Here, social benefit means the benefit accruing to Auckland as a whole, rather than to an individual (private benefit).

Table 2-1 Benefits of residential building height restrictions

Benefit	Private or social benefit?	Source
Certainty for residents on the urban form of their neighbourhood	Private	Informal discussions with city planners
Improved access to light and air at street level / preservation of environmental quality (less trapped air pollution, less shading)	Social	Arnott and MacKinnon (1977) and Ding (2013)
Aesthetical value / historical preservation benefits	Social	Arnott and MacKinnon (1977) and Ding (2013)
Fewer wind tunnel effects	Social	Arnott and MacKinnon (1977)
More social interactions between humans in shorter buildings	Private	Arnott and MacKinnon (1977)
Urban amenity benefits	Social	Ding (2013)
Existing private views are protected	Private	Glaeser et al (2005)
Less pressure on urban infrastructure	Social	Ding (2013)

[5] Developers can apply for a building consent to exceed stated height limits in the current operative plans.

Aesthetical value and historical preservation benefits are intrinsically linked. Here, we assume that the urban form or shape of a city is something that is desired and valued by residents of a city, thus protection of the 'look' of the city and any historical or heritage characteristics drives the benefit.

Neither Arnott and MacKinnon (1977) nor Ding (2013) attempt to quantify the size of the benefits of building height regulations, but both note that this process is a difficult and often fraught task. However, an understanding of the costs of building height regulations can assist with making decisions over whether the benefits of height restrictions can justify the costs. This is ultimately how this study proceeds.

2.2.2 Costs

2.2.2.1 Increased travel costs – time and money

Turning to the costs of building height restrictions, the major effect of imposing height restrictions is that the city sprawls. Residents are pushed to live further out, which increases their travel costs in terms of time and money from their place of employment.

Several studies have been conducted on quantifying the costs of building height regulations.[6] These are summarised below in Table 2-2.

[6] Many of the studies listed below employ a monocentric city model. The summary in Kulish, Richards and Gillitzer (2011) provides useful background material on the model.

Table 2-2 Costs of residential building height restrictions

Study	City	Key findings
Arnott and MacKinnon (1977)	Stylised Toronto	• A city-wide height restriction of 10 storeys could cost each household 0.15% of their annual income. • A city-wide height restriction of 5 storeys could cost each household 0.57% of their annual income.
Ding (2013)	Beijing	• Beijing's building height restrictions in its CBD are associated with a decrease in housing output of 70%, a decrease in land prices of 60% and a decrease in land investment of 85%. • To accommodate the decrease in housing output: o The city sprawls by 12%. o House prices rise by 20%.
Brueckner and Sridhar (2012)	Bangalore	• The city sprawls by 10% to overcome the decrease in housing output. • The price per square foot of housing increases in the restricted city. • Dwellings are smaller in the restricted city as households reduce their consumption of floor space.

Kulish, Richards and Gillitzer (2011)	Stylised Australian city	• House prices are higher in the scenario with building height restrictions than without. • Dwellings are smaller in the scenario with building height restrictions than without. • Buildings are shorter closer to the CBD, but taller farther away from the CBD (to accommodate all the people who can no longer live close to the CBD) with building height restrictions. • Accordingly, density is lower closer to the CBD but higher farther away from the CBD with building height restrictions. • Land prices fall closer to the CBD but rise farther away from the CBD with building height restrictions. • The city sprawls by almost 5km.

Kulish, Richards and Gillitzer's findings are presented graphically below in Figure 2-1.

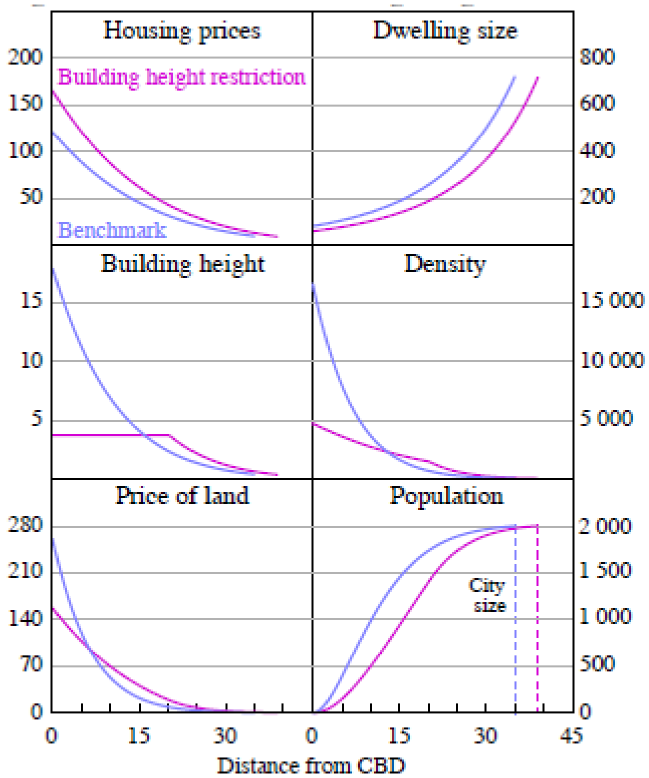

Figure 2-1 Effects of a four-storey building height restriction in a stylised Australian city. Vertical axis labels are as follows: Housing prices graph – dollars per square meter of living space per year; dwelling size – square meters of living space; building height – housing floor space per unit of land (roughly corresponds to storeys); density – persons per square km; price of land – the rental price of land in thousands of dollars per hectare per year; population – in thousands of people.

Source: Kulish, Richards and Gillitzer (2011)

2.2.2.2 Impact on housing prices

As noted above, an increase in housing prices has been established following the imposition of building height regulations. Glaeser et al (2005) also use house price data to provide evidence for the effects of regulations.

Glaeser et al (2005) do not analyse building height regulations, per se, but investigate the suite of regulations in Manhattan and its impact on house prices.

In the neo-classical world, developers continue to supply housing units until profits can no longer be reaped. The authors argue that real increases in house prices should lead to more new housing output in a free market. In Manhattan, where vacant lots are scarce, the critical assumption is that there are no other barriers (such as technology barriers) to building another housing unit up.

The authors compare the sale price (per square foot) of apartments in Manhattan and compare this to the marginal cost of building another unit. Where land is in short supply, the marginal cost of building another unit is the cost of building a housing unit vertically,

Using historical sales data and publically available construction cost estimates, the authors found that the price-to-construction cost ratio (PCC) has increased over the last two decades. In 2002, the PCC was just over 2 in Manhattan. The difference between the two is coined as a "regulation tax". The authors purport that house prices are inflated due to the inability of developers to continue to supply housing units to the point where price is equal to marginal costs.

Due to the relative ease of estimating the costs of building height regulations as well as data availability, this paper adopts the approach of Glaeser et al (2005).

3.0 A regulatory tax for Auckland?

In this section, we apply the method developed in Glaeser et al (2005) to identify whether there is any evidence of a regulatory tax in Auckland.

3.1 Underlying theory

The underlying assumption that drives the analysis by Glaeser et al (2005) is that land use restrictions stop the market from supplying housing units to meet meeting equilibrium. Standard economic theory predicts that housing supply meets housing demand in equilibrium when price is equal to marginal cost. That is, without any regulatory barriers, housing units will continue to be built until the cost of construction exceeds the market price.

Box 2: Profit maximising behaviour of developers and observed building heights

A developer faces many decisions when considering a new residential development. They must decide what type of development to build (e.g. standalone dwellings or a multi-unit building, the height of the building, the size of the housing units) within the planning regulations. Developers trade off the expected sale price (aggregate sale price of each individual housing unit sold) with the expected cost of development and act to maximise the potential profit of the development. Note developers will work at different price points in the market and will seek to maximise profits in their given price and quality bracket.

A developer is likely to have more certainty over expected construction costs but less certainty over the sale price per housing unit. The sale price is likely to reflect a host of factors, including characteristics of the development itself i.e. the scale and type of the development and its height, as well as the attractiveness of the area.

The results of developers' profit maximising expectations are the developments and buildings we observe.

In Manhattan, land available for residential development is scarce but developers can build up. Thus, the marginal cost of a new housing unit is the marginal cost of an additional storey.

The theory is not able to differentiate between different types of regulation (e.g. a height regulation or a density regulation or a view protection plane) which prohibits further development. This is why it is coined a regulatory tax, rather than a specific cost of height regulations. Formally, the *"regulatory tax"* is the differential between the market price for an apartment (per square meter) and the marginal construction cost.

Box 3: A regulatory tax or a height tax?

The theory set out in Glaeser et al (2005) is that land use restrictions are a natural explanation for the gap in the price of housing and the supply costs. The authors argue that the limited supply response following house price growth is due to the result of an increasingly restrictive regulatory environment, which is coined a regulatory tax.

Regulation in this analysis refers to the regulations that affect the supply of housing (including, but not limited to, height regulations, zoning rules, density constraints, height to boundary ratios) on existing sites.

The approach in this paper does not capture standalone dwellings well because the cost of land needs to be included in the analysis. As such, the analysis pertains to regulations which restrict the supply of housing units vertically. This is because if a developer is considering a three storey building, the marginal cost of building a fourth storey is fairly independent of land.

There are several assumptions which need to be met, in order for the theory to hold. These are:

- **The construction industry is competitive**. An explanation for the price differential would be if construction companies are able to exploit higher than normal, competitive profits. Therefore, the assumption of a competitive construction market is required.

- **There are no technology barriers to building up**. A second explanation for the price differential would be the inability of construction firms to continue to build apartments vertically due to technological constraints.

Due to the strength of the assumptions needed, only large differences are interpreted as evidence for a regulatory tax. The regulatory tax could be overestimated if the market is not competitive or true marginal cost is higher than data suggests.

3.2 The Auckland context

Auckland is not Manhattan but there could be similarities between the housing situation in the Auckland isthmus and Manhattan. In Auckland, there is also a shortage of vacant land for development in the isthmus[7] where house prices have been increasing faster than non-isthmus areas in recent years.

Figure 3-1 and Table 3-1 below show house price inflation in isthmus suburbs and a weighted average composite for non-isthmus suburbs. In this sample, house price inflation

[7] At May 2012, there were approximately 5,007 parcels of zoned residential land that were vacant within Auckland's urban area (Fredrickson and Balderston, 2013). Fredrickson and Balderston (2013) refer to the urban area as within the Metropolitan Urban Limit at May 2012, an area broader than the isthmus.

has been strongest in Mt Eden/Epsom since June 2009. There has been some house price inflation in non-isthmus suburbs, but this is typically lower than the isthmus suburbs.

As can be seen below, with the exception of the City/Point Chevalier group, house price inflation has been positive since June 2009, the post-GFC low for median house prices in Auckland.

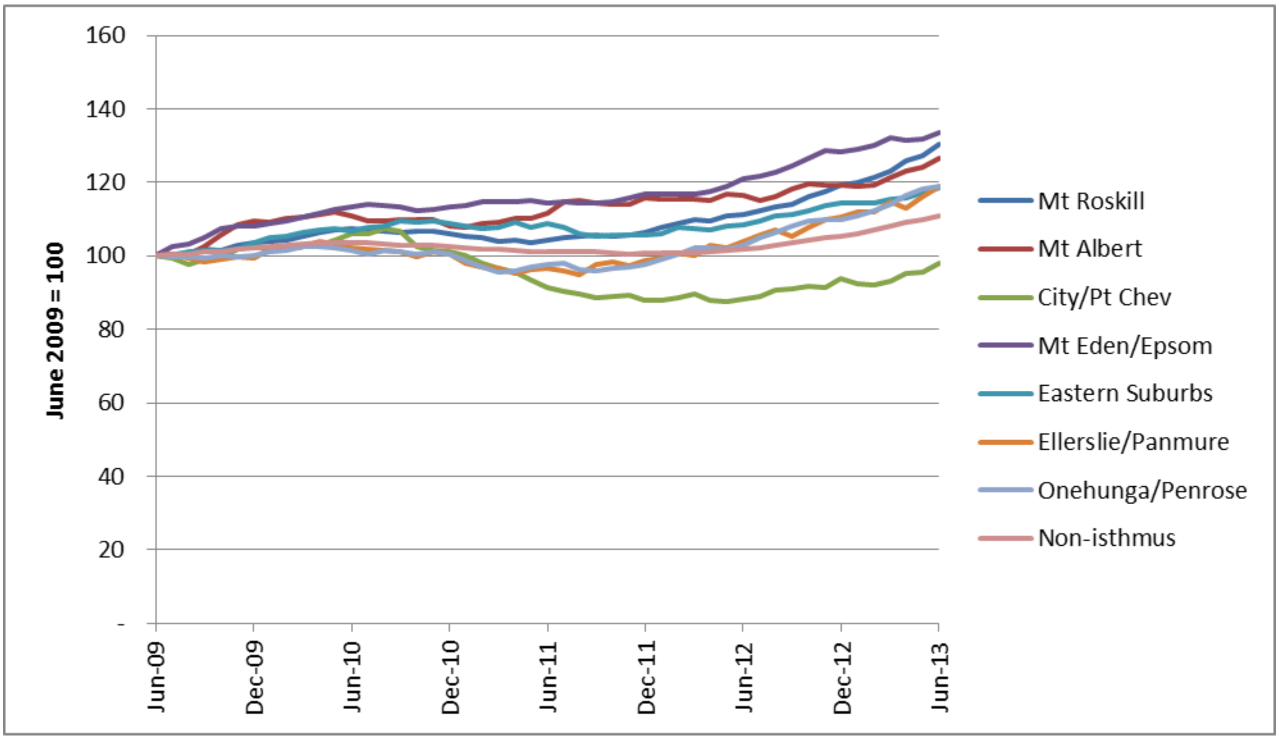

Figure 3-1 House price inflation since 2009 (post-recession low) in isthmus suburbs and non-isthmus. Source: REINZ

Table 3-1 House price inflation since 2009 in isthmus suburbs and for the non-isthmus weighted average composite

	Annual average real sale price Year to June 2009	Annual average real sale price Year to June 2013	Percentage change
Mt Roskill	$454,745	$593,382	30.5%
Mt Albert	$521,788	$660,787	26.6%
City/Point Chevalier	$362,810	$355,289	-2.1%
Mt Eden/Epsom	$629,911	$841,473	33.6%
Eastern Suburbs	$781,998	$927,835	18.6%
Ellerslie/Panmure	$477,582	$568,365	19.0%
Onehunga/Penrose	$411,063	$489,406	19.1%
Non-isthmus	$481,400	$533,790	10.9%

Source: Author's calculations using REINZ and Statistics NZ data. Prices adjusted to $2013 December quarter

Continued house price inflation should stimulate construction of new housing units, so that supply of housing units increases. The three figures below (Figure 3-2, Figure 3-3 and Figure 3-4) show the total number of housing units consented, the number of standalone dwellings consented and the number of flats and apartments consented plotted against house price appreciation (over all housing types) in the previous year.

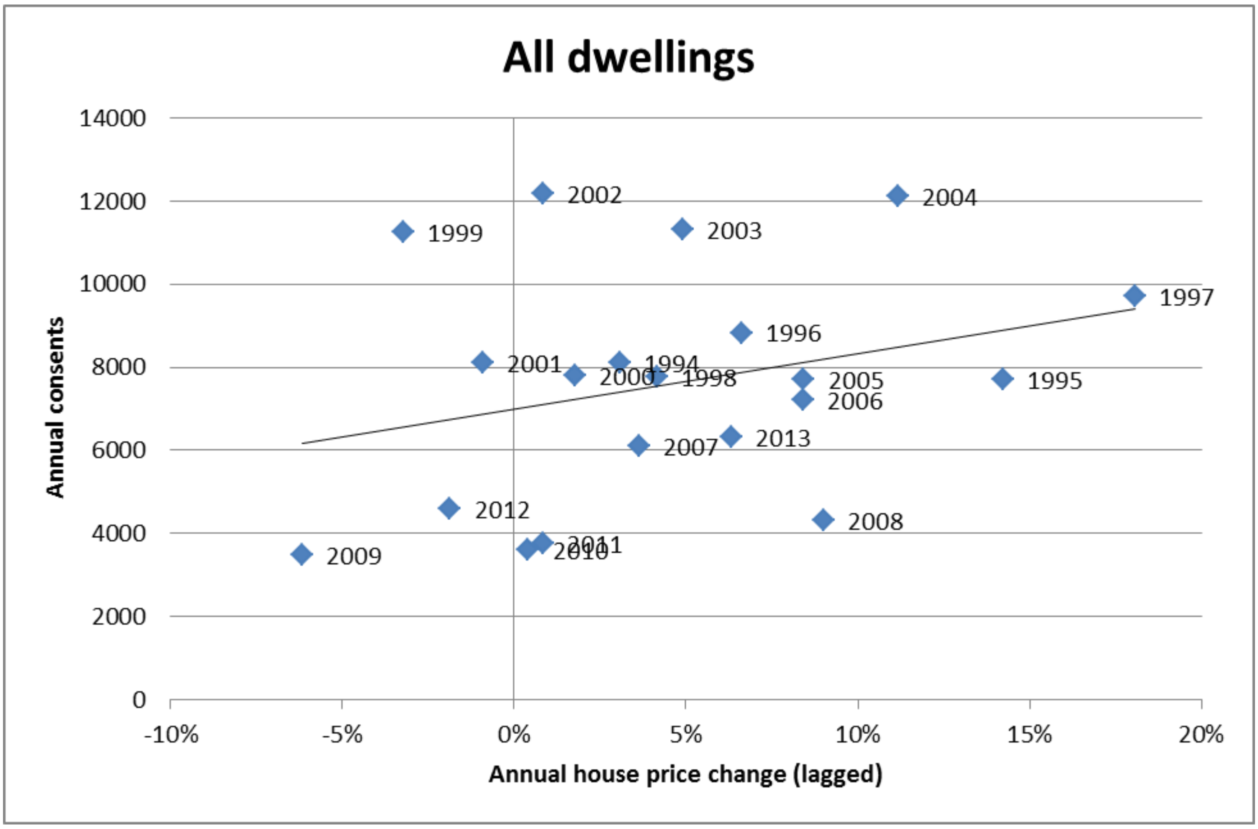

Figure 3-2 Annual house price growth (lagged one year) and annual consents
Source: REINZ and Statistics New Zealand

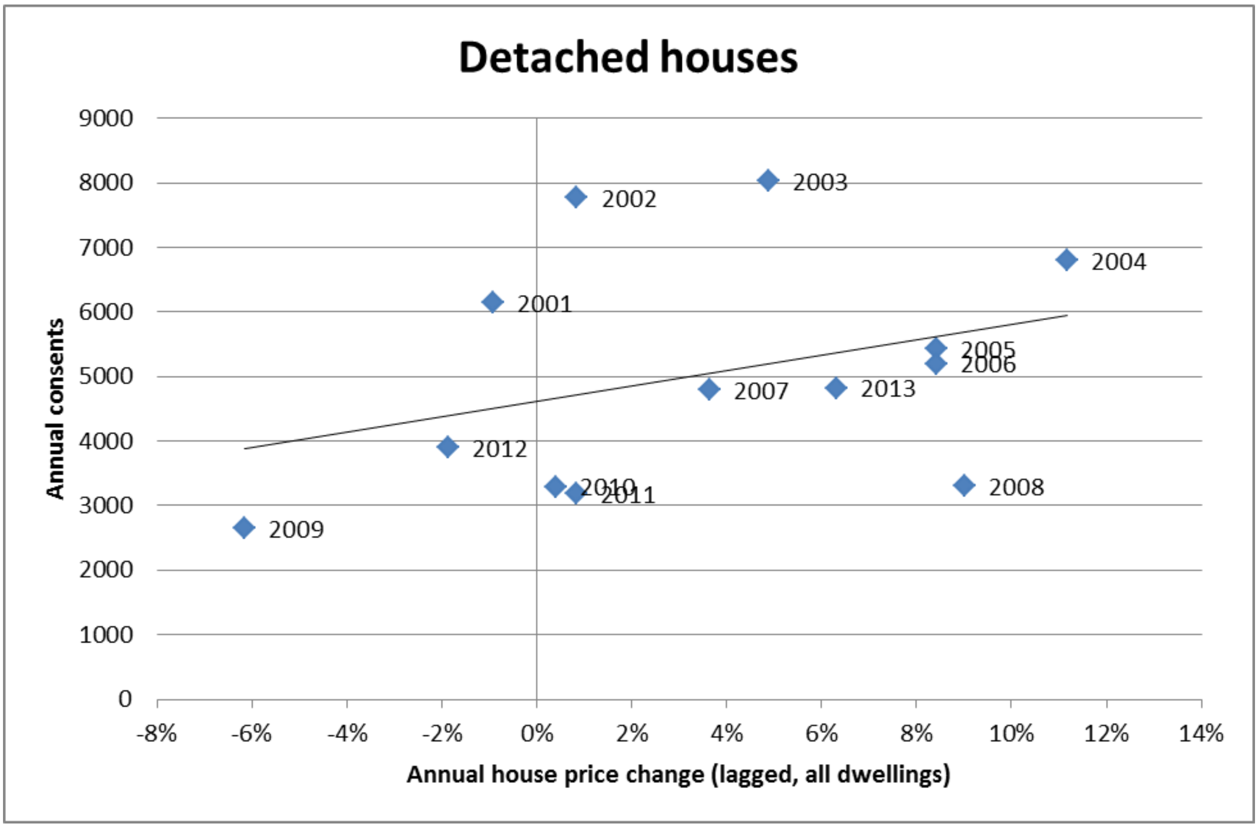

Figure 3-3 Annual house price growth (lagged one year, all dwellings) and annual consents for detached housing

Source: REINZ and Statistics New Zealand

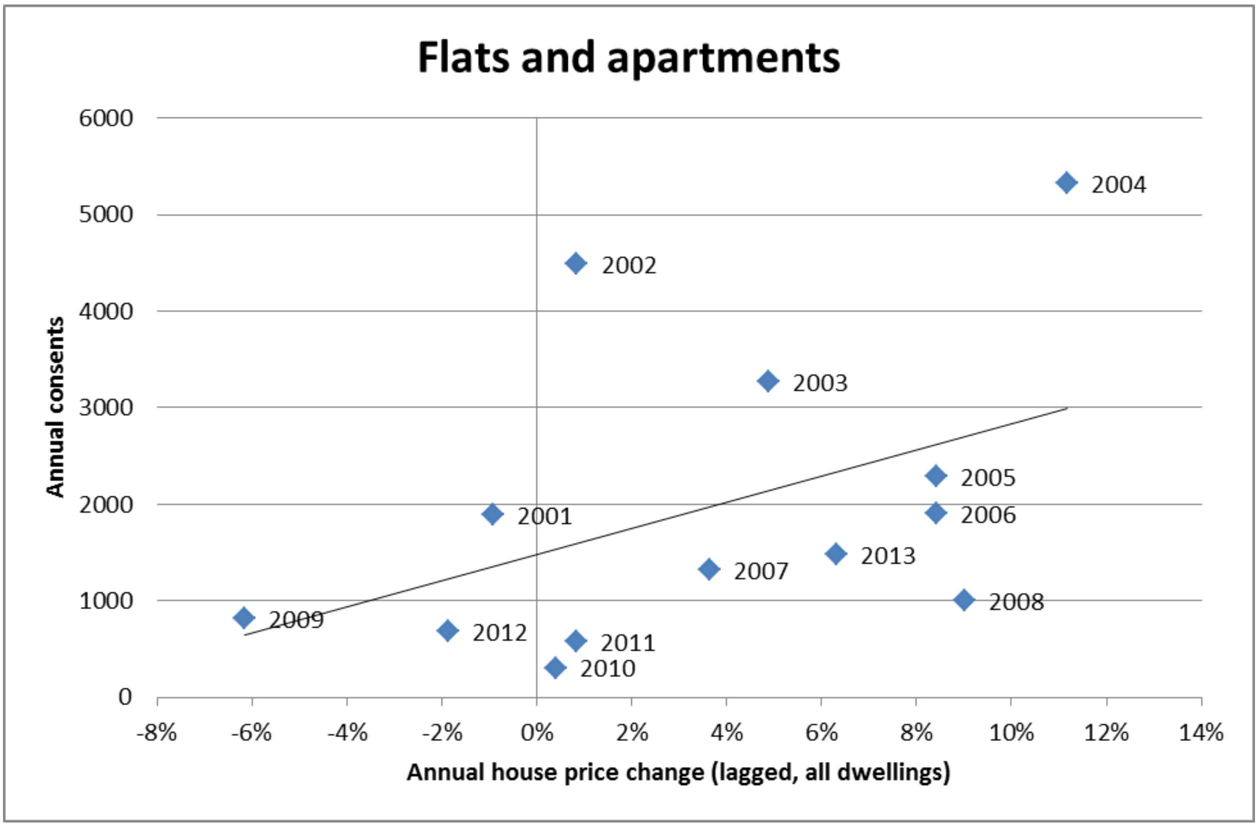

Figure 3-4 Annual house price growth (lagged one year, all dwellings) and annual consents for flats and apartments

Source: REINZ and Statistics New Zealand

Economic theory predicts that house price growth should stimulate construction of more housing units to satisfy the demand, in the absence of barriers. We expect to see a positive relationship between the two variables and we do observe a trendline which is upward sloping in all three figures above. However, these relationships are not statistically significant (p-values 0.217, 0.248 and 0.1244 respectively).

So far the evidence base suggests that a housing supply response has not followed house price growth. There could be several reasons why we do not observe a relationship here. Some reasons include, but are not limited to, a requirement for sustained house price growth (the above graphs only look at the annual relationship between house price growth and new consents, not over a longer timeframe) before there is a supply response from developers; house price growth reflects consumer demand for land, rather than a dwelling; developers would like to build housing units but are unable to for various reasons (e.g. lack of access to finance).

3.2.1 Auckland's construction industry

The first assumption made by Glaeser et al (2005) is that the construction industry is competitive. If this assumption is not held, an estimation of the proposed regulatory tax is likely to be too high.

The construction industry spans from firms that provide inputs to the construction sector (e.g. building materials) to draughters to subcontractors.

The Productivity Commission (March 2012) looked into the competition among manufacturers of building materials. Public submissions to the *Housing affordability inquiry* suggested that as there was a lack of competition in the sector. These claims arose because submitters noted the relatively high price of building materials and linked this with sector characteristics - there are only two major manufacturers of building materials in New Zealand.

There are several reasons why construction costs are described as high in New Zealand. One factor is New Zealand's size. A small population makes it more difficult to create economics of scale in the construction and building industry. The Productivity Commission notes that while New Zealand is open to import competition, New Zealand's distance from markets mean that importing building materials is less likely to occur. These are both reasons why there has been a lack of productivity growth in the sector.

Additionally, transporting building materials within New Zealand is challenging (compared to Australia) due to lack of transport infrastructure, the terrain and shipping materials between the North and South Island, making building more costly than Australia.

The Productivity Commission (2012) concluded that:

- A small number of market players do not necessarily mean that the firms engage in anti-competitive behaviour. The Productivity Commission reports that the Commerce Commission has investigated materials suppliers in the past, but no breaches of the Commerce Act have been found.
- The Productivity Commission found evidence of poor productivity, but poor productivity need not be synonymous with anti-competitive behaviour.

The Commerce Commission found evidence of anti-competitive behaviour in tendering processes in the construction sector (Productivity Commission, 2012). Their research found that some firms engage in 'cover pricing' and will submit a high-priced tender which is not intended to win. Firms know that their bid is higher than a friendly competitor and do not expect to win.

There has been more recent activity by the Commerce Commission since the Productivity Commission released its final report in 2012. In March 2014, the High Court ordered Carter Holt Harvey to pay a penalty of $1.85m after it engaged in price fixing behaviour with Fletcher Distribution for sales of structural timber to commercial customers in Auckland (Commerce Commission, 2014).

The Commerce Commission is also investigating Fletcher's arrangements with building supplies distributors for its plasterboard product. This is investigation is still underway (NZHerald, 2014).

In the following analysis, we assume the construction industry is competitive, though it may not be.

3.2.2 Technological barriers to construction

Technological barriers could be one explanation for an observed gap between the sales price for a housing unit and the marginal cost of construction.

3.3 Auckland data

In this section, we explore the data which is used in the subsequent analysis.

This analysis uses Auckland Council's dwelling sales audit file data, retrieved in March 2014. This rich dataset includes all dwelling sales in the Auckland region and has good data between 2003 and the present. It includes many variables including sale price (gross and net of chattels), building floor area, site coverage, number of off-street carparks, approximate building age, building construction material, building condition, sales group[8], among others (refer to Appendix A for a full list of variables included in the dataset).

The data was cleaned, removing observations from 2014 and prior to 2003 (as the data did not look complete prior to 2003), as well as removing sales records with incomplete information. Only sales recorded at arm's length were retained. Observations were sense checked and any dubious observations were excluded e.g. observations which reported a building floor area of greater than zero but building site coverage of zero were excluded.

For each sale, the sale price (net of chattels) was converted to December 2013 prices using the consumer price index (all groups) from Statistics New Zealand.

A price per square meter variable was created to be used in the analysis:

Price per square meter = Real sale price (net of chattels) / Building total floor area (in sqm)

The construction cost data was kindly provided by property and construction practice Rider Levett Bucknall in May 2014. Construction cost data is available in public sources, but importantly we could not ascertain the relationship between construction cost and the number of storeys from public sources. We approached RLB to seek quantity surveyor estimates on this, in order to construct the marginal cost curve. RLB were able to provide the cost per square meter for small, medium and large apartments for three levels of quality for apartments of 1-3 storeys, 4-7 storeys and 8-24 storeys. A summary of the data provided by RLB is included in Table 3-2 below.

[8] Sales group is a rough locational indicator, which we use and interpret broadly as suburb.

Table 3-2 Construction cost per square meter estimates

		Low-average quality	Medium quality	High quality
Small	1 to 3 storeys	2604	3100	3348
(20-35m2)	4 to 7 storeys	2695	3209	3468
	8 to 24 storeys	2976	3472	3720
Medium	1 to 3 storeys	2108	2852	3100
(50-70m2)	4 to 7 storeys	2171	2938	3209
	8 to 24 storeys	2480	3224	3472
Large	1 to 3 storeys	1860	2356	2604
(90+ m2)	4 to 7 storeys	1916	2427	2682
	8 to 24 storeys	2232	2604	2976

Source: RLB

Statistics New Zealand's capital goods price index (residential buildings) was used to back-cast the cost data provided by RLB to create a quarterly time series to December 2013 prices. However, the capital goods price index for the March and June 2014 quarters was not available at the time of the analysis. As such, we assumed no price appreciation between the December 2013 quarter and May 2014 occurred. This is unlikely in practice, and as a result, means that costs are slightly inflated relative to sales prices. If anything, this strengthens the evidence of a regulatory tax, should there be a gap between observed sales prices and costs.

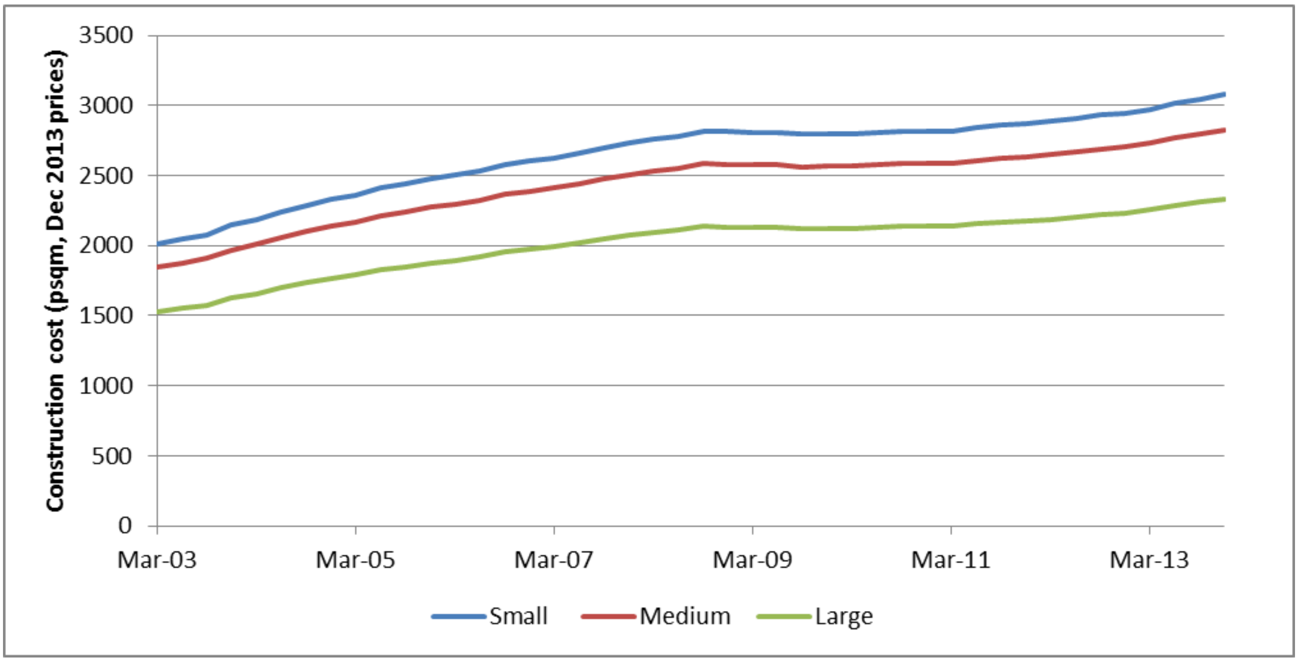

Figure 3-5 Back-cast construction cost (per m2) for construction on a third storey
Source: RLB and Statistics New Zealand

The sales data were filtered by dwelling size and then grouped into three categories:

1. Small: Less than 50 sqm
2. Medium: Between 50 and 90 sqm
3. Large: Greater than 90 sqm

Individual dwelling sales were averaged over each month to generate an average sale price per square meter, per month and then matched to the construction cost estimates for the relevant quarter.

3.4 Marginal cost of construction

For each apartment size, the medium quality estimates were used as the benchmark and the mid-point between each height bracket was used, providing coordinates along a marginal cost curve to be solved. The cost curves are below in Figure 3-6.

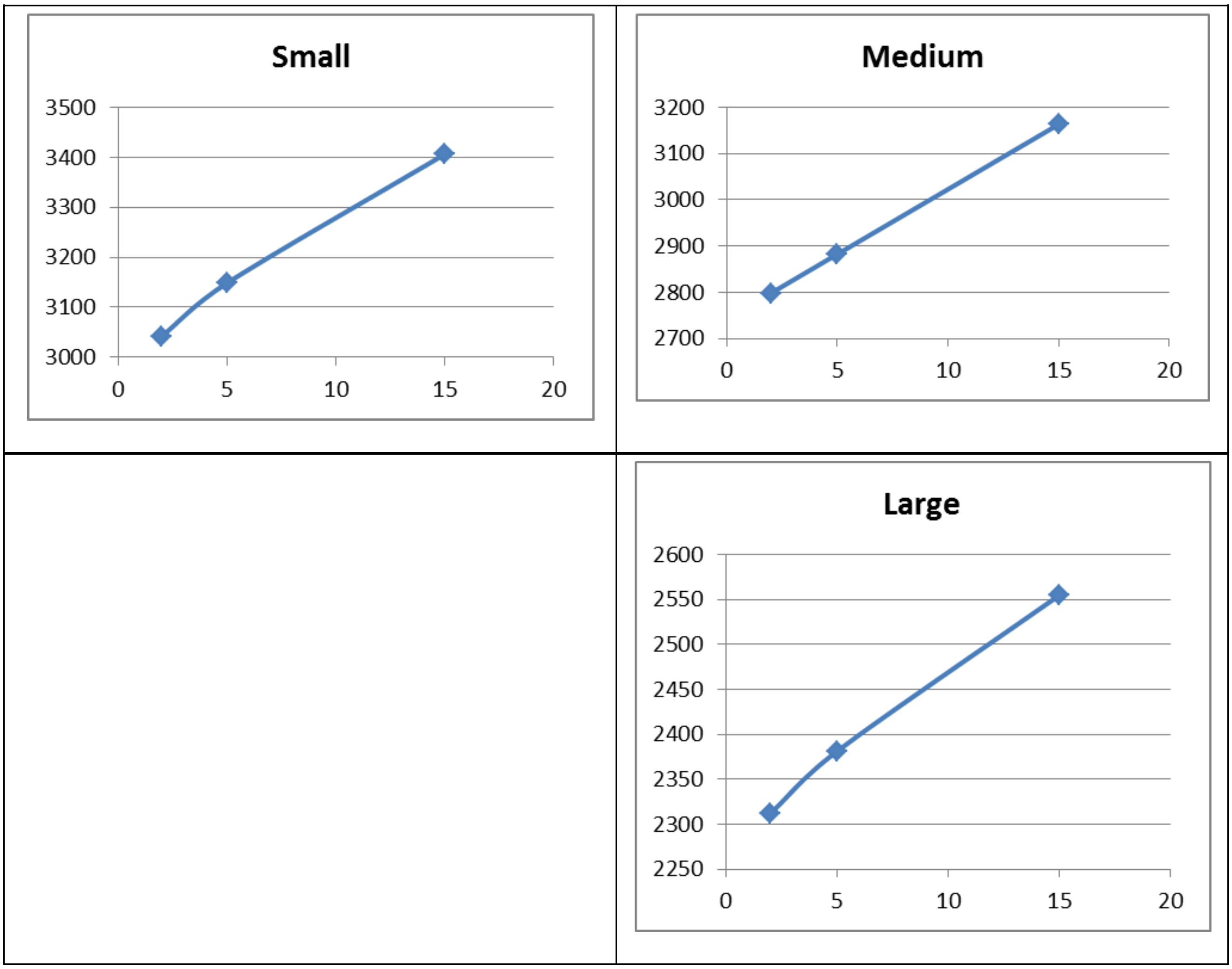

Figure 3-6 Marginal cost curves by size of apartment (clockwise from left: small; medium, large). All x-axis are the number of storeys and all y-axis are the construction cost per square meter.
Source: RLB

All three apartment sizes display upward sloping marginal cost curves. All three apartment sizes were fitted with a quadratic function, although the small and large apartment sizes were best with a negative quadratic.

The marginal cost of construction on the third floor was estimated for each dwelling size by solving the marginal cost equation. This was because approximately 73% of the dwellings sold in the database were two storeys, so improving supply could be achieved by the addition of a third storey onto these dwellings.

The marginal cost of construction on the 15th floor for high quality apartments (of all sizes) was also estimated and used as a sensitivity check for the analysis. This represents a sensitivity check on the high-end of the spectrum, because if there is a differential between the sale price and construction cost this strengthens the evidence base for the existence of regulatory tax in Auckland.

3.5 Results

Figure 3-7 below shows the results of comparing sale price to construction cost (of a third storey) for small, medium and large apartments. As indicated below, the sale price well exceeds the construction cost resulting in a price to construction cost ratio in excess of 1.7 over the last ten years for all three dwelling sizes. The price to construction cost ratio appears to have increased since 2009 for medium and large apartments.

Figure 3-7 Price to construction cost ratio (marginal cost of third storey). All left hand axis: $2013 prices, all right hand axis: ratio of price to construction cost.

At the end of 2013, the price to construction cost ratio was 2.64 for small dwellings, 2.47 for medium dwellings and 2.59 for large dwellings, figures all well above 1. Note that the small dwelling size series appears more volatile, because of fewer sales in this category. Table 3-3 below shows the minimum and maximum price to construction cost ratios across the sample timeframe.

Table 3-3 Price to construction cost ratios (range: 2003-2013)

	Minimum	Maximum
Small	1.78	5.77
Medium	1.97	2.86
Large	2.14	3.19

Sensitivity testing was performed using high end cost estimates. The high-quality cost estimates were used and the price to construction cost ratio for all three size brackets are shown below in Figure 3-8. The PCC ratio is still in excess of 1.5 for all three apartment sizes.

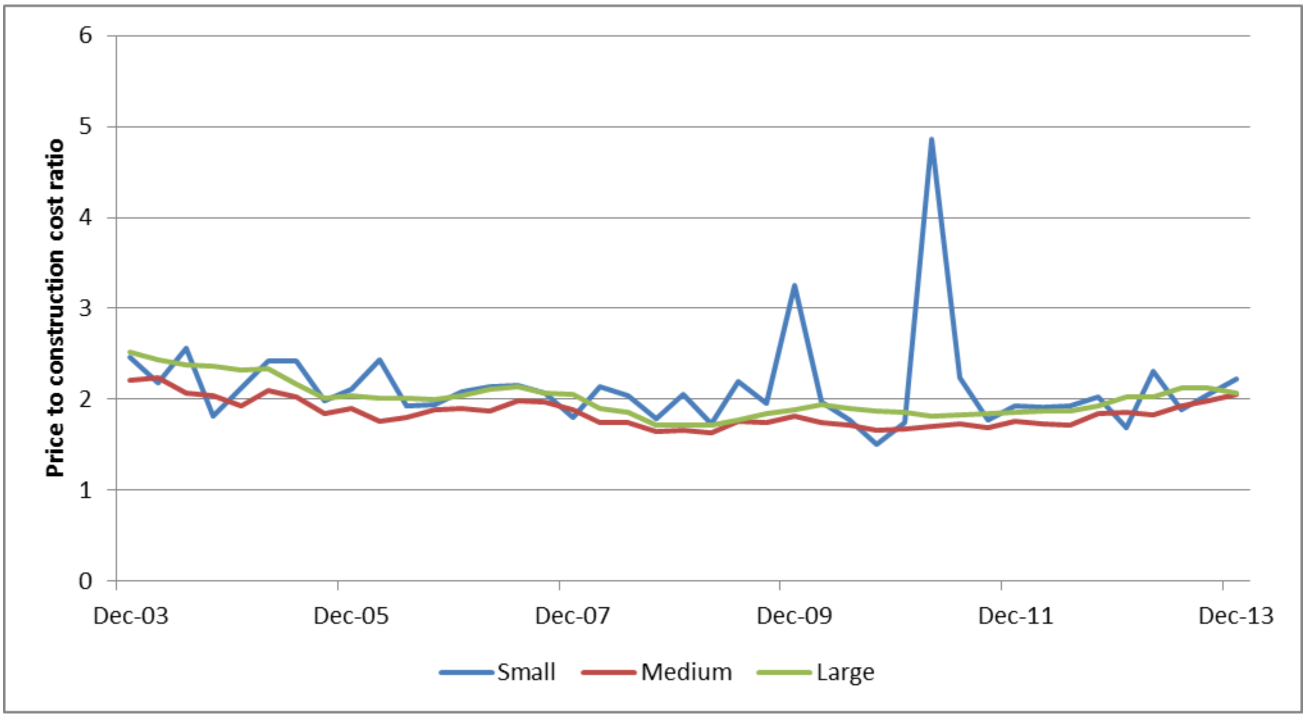

Figure 3-8 Sensitivity testing: price to construction cost ratio for marginal cost of 15th storey, high quality cost estimates.

As indicated above, there is evidence that the supply of housing is constrained relative to demand. One reason for this could be the inability to build up. Constructing an extra dwelling upwards requires no extra land, although it is noted that this would impose additional demand on existing infrastructure.

3.6 Caveats and limitations

This analysis is not a specific height analysis, as such attributing the entire difference between the sale price and construction cost to the height regulations is incorrect. A wide range of height regulations (explicit height regulations, viewshafts, floor area ratios) could be factors in why dwellings stop at two storeys, but also other regulations, such as density regulations or height to boundary ratios, could be other reasons why dwellings are not built taller. Additionally, there could be consumer preference for dwellings no taller than two storeys.

It should be noted that there is the ability to build higher than the rules allow, by applying for a building consent. In other words, the regulations can be circumvented and more height can be achieved. However, developments may still not proceed due to non-regulatory factors (such as the inability to obtain financing).

4.0 Discussion/Conclusion

The analysis presented in this report provides some insight into the effects of regulating building heights.

We find evidence of a regulation tax in Auckland. Recent consenting levels have been low relative to population growth but additional demand for housing has not translated to more housing units being built. Instead it has translated into an increase in housing prices.

We find that the price to construction cost ratio was 2.64 for small dwellings, 2.47 for medium dwellings and 2.59 for large dwellings at the end of 2013 in Auckland. These ratios are large. The ratio for medium dwellings and large dwellings increased over the last few years. These ratios are likely to widen with population growth unless sufficient housing is built to play catch up to pent up demand.

We purport that the large gap between the price of selling a housing unit and the marginal cost of building a unit is due, in part, to a suite of regulation which restricts the new supply of housing units. The incentive for developers to build an extra unit of housing vertically is clear – but this is not occurring. One reason for this is that regulation restricts developers from building the marginal unit of housing.

It is acknowledged that this gap is not wholly attributable to regulation, nor is it directly attributable to height restrictions. Consumer preferences for land as well as developers' inability to obtain finance for development are two possible and plausible reasons why we observe the gap between the price of selling a new housing unit and the marginal cost of producing a new housing unit vertically.

However, this gap is large with sales prices more than double the cost of construction. The suite of policy controlling development is one explanation for this gap. This implies that regulations could have a far greater role to play in housing markets than has been thought with primary implications for housing supply and secondary implications for housing affordability.

Two key conclusions are as follows:

- ➔ The suite of planning regulations which control height are likely to have restricted the supply of new housing more than is realised.
- ➔ The reduced supply of housing units impacts housing affordability.

What would happen if height restrictions were relaxed?

First, it is likely that the supply of housing units would increase. We expect that development would occur in locations that match demand. Demand is likely to be high in areas close to employment opportunities, transport links, urban amenities as well as natural amenities such as parks or beaches.

Second, we expect there would be a price effect and housing affordability could improve. The price effect would likely only occur if developers read demand signals correctly and increase supply in line with demand. If developers increase supply and develop where demand is not sufficiently strong, there may not be changes to overall affordability.

It is acknowledged that existing infrastructure may have to be upgraded to increase capacity which would also have cost implications.

The social costs of not having height restrictions

Removing height restrictions could also have other implications. It could generate uncertainty throughout a community as to whether a new development would pop up next door. Developers currently have the ability to exceed current height restrictions by applying for a building consent. The consenting process allows a community to provide input on a proposed development.[9]

There would be other effects of removing height restrictions, including:

- Potential disruption to sightlines/vista to natural and cultural landmarks (social cost)
- Blocked private views (private cost)
- Potential shading problems/loss of natural light (social cost[10] and private cost)

Auckland's trade-off – up or out?

Auckland is planning for growth. Compounded with the current housing shortage, additional people will continue to demand housing units in places which are close to employment opportunities, schools, transport links as well as urban and natural amenities.

One way to increase the supply of housing units is release more land by expanding the urban limit. Another way to improve the supply of housing units is to allow more height.

There are obvious benefits to allowing more height to increase housing supply. No new land is required, there is less environmental impact (i.e. sprawl is contained). Housing can be built in areas where people want to live, meaning shorter aggregate commute times to places of employment and urban amenities.

However, this is not cost-less for Auckland. A significant social cost would be the loss of sightlines to natural and cultural landmarks and a change in Auckland's urban form. Not all views would be affected in the same way; others are not likely to be affected at all.

Auckland needs to decide whether it is prepared to increase height limits to increase the supply of housing and improve housing affordability. This is not the only way to improve housing supply and affordability, but the analysis suggests that the market is likely to take up the option, if it were available.

Further work

The analysis and observations in this report pose additional questions which lend itself to further consideration. However, given the large observed gap between prices and

[9] Consultation could still occur if other development controls were breached or height regulations were not removed entirely, but relaxed (e.g. to 10 storeys or 15 storeys).

[10] For example, a protection plane protects Aotea square from surrounding development that would create shadows over the square.

construction costs, the first step will be to get some robustness around the construction cost estimates.

Areas for future work could include understanding the role of land in the analysis as well as understanding whether the price to construction cost ratio changes spatially across Auckland.

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Appendix A

A full list of variables in the sales audit file is below. See http://www.linz.govt.nz/valuation/rules-and-regulations/DocumentSummary.aspx%3Fdocument%3D296 for explanations of the variables.

Field text	Field #	Field name	Start	End	Type*	Length	Dec†
Valuation No. Roll	1	VNROLS	1	5	S	5	0
Valuation No. Assessment	2	VNABRS	6	16	S	11	0
Valuation No. Suffix	3	VNSUFS	17	18	A	2	
Sale Date	4	SLDATS	19	26	S	8	0
District (Territorial Authority) Code	5	DISTCS	27	28	S	2	0
Sale Type	6	SLTYPS	29	29	A	1	
Sales Group	7	SLGRPS	30	33	S	4 ^	0
Sale Tenure	8	SLTENS	34	34	S	1	0
Price/Value Relationship	9	BSRELS	35	35	S	1	0
Sale Price Gross	10	SLPGRS	36	46	S	11	0
Sale Price Net	11	SLPNTS	47	57	S	11	0
Sale Price Chattels	12	SLPCTS	58	68	S	11	0
Sale Price Other	13	SLPOTS	69	79	S	11	0
Capital Value	14	CPTVLS	80	90	S	11	0
Land Value	15	LNDVLS	91	101	S	11	0
Current Effective Valuation Date	16	COLDDS	102	109	S	8	0
Situation Number	17	SITNOS	110	113	S	4	0
Additional Situation Number	18	SETNOS	114	117	A	4	
Situation Name	19	SITSTS	118	147	A	30	
Certificate of Title	20	CTRFRS	148	159	A	12	
Land Area†	21	LNDARS	160	171	S	12	4
Zoning	22	LUZONS	172	173	A	2	
Actual Property Use	23	LNDUSS	174	175	S	2	0
Units Of Use	24	UNITPS	176	178	S	3	0

Field text	Field #	Field name	Start	End	Type*	Length	Dec†
Off-street Parking	25	GARPAS	179	181	S	3	0
Building Age Indicator	26	BLDAGS	182	184	A	3	
Building Condition Indicator	27	BLDCDS	185	186	A	2	
Building Construction Indicator	28	BLDCNS	187	188	A	2	
Building Site Coverage	29	BLDSCS	189	194	S	6	0
Building Total Floor Area	30	BLDFRS	195	200	S	6	0
Property Category	31	CATGYS	201	206	A	6	
Legal Description	32	LDESCS	207	244	A	38	
Mass Contour	33	MACTRS	245	246	A	2	
Mass View	34	MAVEWS	247	247	A	1	
Mass Scope of View	35	MASCPS	248	248	A	1	
Mass Total Floor Area	36	MATFRS	249	251	S	3	0
Mass Deck	37	MADEKS	252	252	A	1	
Mass Workshop Laundry	38	MALANS	253	253	A	1	
Mass Other Improvements	39	MAIMPS	254	254	A	1	
Mass Garage Under Main Roof	40	MAGR2S	255	255	S	1	0
Mass Garage Freestanding	41	MAGR1S	256	256	S	1	0
Production	42	PRODNS	257	263	S	7	0
Valuer's Remarks	43	SLREMS	264	298	A	35	
Vendor/Purchaser names	44	SLVENS	299	320	A	22	

* 'Type' means alpha (A) or numeric (S)

† 'Dec' means the number of decimal places allowed in a numeric field and, in the case of land area, this must be recorded in hectares

^ 'Length' of the 'Sales Group' field has been expanded from two to four characters to accommodate Auckland Super City Sales Group codes. The 'Sales Group' field is still able to be held and received electronically as a two character field for other areas of New Zealand.

Source: LINZ

Appendix B – Current and height regulations in Proposed Auckland Unitary Plan

	Existing plans	March 2013 draft plan	Proposed Auckland Unitary Plan	
Metropolitan Centres			**Heights**	**Other height restrictions**
Albany, Botany, Henderson, Manukau	Unlimited (in parts)	72.5m (18 storeys)	72.5m (18 storeys)	None
New Lynn	25m	72.5m (18 storeys)	72.5m (18 storeys)	None
Newmarket	33m (9 storeys)	72.5m (18 storeys)	32.5m (8 storeys)	Subject to special rules including volcanic viewshaft height sensitive areas and special character overlays
Papakura	21m	72.5m (18 storeys)	Maximums range from 24.5m (6 storeys) to 40.5m (10 storeys)	None
Sylvia Park	Maximums range from 10m to 60m defined in site specific concept plan	Maximums range from 10m to 60m	Maximums range from 10m to 60m	Subject to special rules including Sylvia Park precinct
Takapuna	Maximums range from 8m to unlimited	Specific provisions dictate height	Specific provisions dictate height	Subject to special rules including Takapuna 1 precinct
Westgate/ Massey North	30m	72.5m (18 storeys)	32.5m	Subject to special rules including Massey North precinct

Town Centres			Heights	Other height restrictions
Avondale	12.5m	32.5m (8 storeys)	32.5m (8 storeys)	None
Birkenhead	Maximums range from 9m to 12m to 18m	24.5m (6 storeys)	Maximums range from 16.5m (4 storeys) to 20.5m (5 storeys) to 24.5m (6 storeys)	None
Browns Bay	12.5m	24.5m (6 storeys)	Maximums range from 12.5m (3 storeys) to 16.5m (4 storeys)	Subject to special rules including Browns Bay precinct
Devonport	9m	16.5m (4 storeys)	12.5m (3 storeys)	Subject to special rules including the blanket height sensitive area overlay (8m maximum)
Ellerslie	12.5m	12.5m	12.5m (3 storeys)	Subject to special rules including the special character overlay
Glen Eden	Unlimited	24.5m (6 storeys)	24.5m (6 storeys)	None
Glen Innes	Maximums range from 12.5m to 15m	32.5m (8 storeys)	32.5m (8 storeys)	None
Glenfield	Maximums range from 9m to 12m	24.5m (6 storeys)	Maximums range from 16.5m (4 storeys) to 24.5m (6 storeys)	None
Helensville	10.5m	Maximums range from 12.5m (3 storeys) to 16.5m (4 storeys)	Maximums range from 12.5m (3 storeys) to 16.5m (4 storeys)	Subject to special rules including the special character overlay
Highland Park	Unlimited	24.5m (6 storeys)	24.5m (6 storeys)	None
Howick	Maximums range from 9m to 10.5m to 12m	Maximums range from 9m to 10.5m to 12m	Maximums range from 9m to 10.5m to 12m	Subject to special rules including the special character overlay
Hunters Corner	Unlimited	16.5m (4 storeys)	16.5m (4 storeys)	None

Town Centres			Heights	Other height restrictions
Kumeu/Huapai	Maximums range from 10.5m to 12.5m	16.5m (4 storeys)	16.5m (4 storeys)	Subject to special rules including the Kumeu precinct
Mangere	Unlimited	16.5m (4 storeys)	16.5m (4 storeys)	None
Manurewa	Unlimited	32.5m (8 storeys)	24.5m (6 storeys)	None
Milford	9m	32.5m (8 storeys)	Maximums range from 16.5m (4 storeys) to 24.5m (6 storeys)	None
Mt Albert	Maximums range from 10m to 12.5m to 15m	16.5m (4 storeys)	16.5m (4 storeys)	Subject to special rules including volcanic viewshaft height sensitive areas overlay
Newton / Upper Symonds St	15m	32.5m (8 storeys)	16.5m (4 storeys)	Subject to special rules including special character overlay
Northcote	9m	32.5m (8 storeys)	24.5m (6 storeys)	None
Onehunga	12.5m and specific height control for Onehunga Mall	16.5m (4 storeys) and specific height control for Onehunga Mall	24.5m (6 storeys) and specific height control for Onehunga Mall	Subject to special rules including volcanic viewshaft height sensitive areas and historic heritage overlays
Orewa	10.5m	24.5m (6 storeys)	Maximums range from 8.5m (2 storeys) to 16.5m (4 storeys) to 24.5m (6 storeys)	None
Ormiston	16m	32.5m (8 storeys)	32.5m (8 storeys)	None
Otahuhu	30m and specific height control (10m) for sites along Great South Road	32.5m (8 storeys)	Maximums range from 12.5m (3 storeys) for selected sites along Great South Road to 24.5m (6 storeys)	Subject to special rules including the special character overlay
Otara	Unlimited	16.5m (4 storeys)	16.5m (4 storeys)	None
Pakuranga	Unlimited	32.5m (8 storeys)	48.5m (12 storeys)	None
Panmure	12.5m	32.5m (8 storeys)	Maximums range from 16.5m (4 storeys) to 24.5m (6 storeys)	Subject to special rules including the volcanic viewshaft height sensitive areas overlay
Papatoetoe	Unlimited	24.5m (6 storeys)	24.5m (6 storeys)	None
Parnell	12.5m	12.5m (3 storeys)	12.5m (3 storeys)	Subject to special rules including special character overlay
Ponsonby	Maximums range from 8m to12.5m	Maximums range from 12.5m (3 storeys) to 16.5m (4 storeys)	12.5m (3 storeys)	Subject to special rules including special character overlay
Pt Chevalier	12.5m	16.5m (4 storeys)	Maximums range from 16.5 (4 storeys) to 20.5 (5 storeys)	None
Pukekohe	12m	16.5m (4 storeys)	Maximums range from 12.5m (3 storeys) to 16.5m (4 storeys)	None

Town Centres			Heights	Other restrictions
Remuera	12.5m	16.5m (4 storeys)	16.5m (4 storeys)	None
Royal Oak	12.5m	32.5m (8 storeys)	24.5m (6 storeys)	Subject to special rules including volcanic viewshaft height sensitive areas overlay
Silverdale	Maximums range from 10.5m to 12.5m	32.5m (8 storeys)	Maximums range from 8.5m (2 storeys) to 16.5m (4 storeys)	None
St Lukes	Maximums range from 12.5m to defined specific heights in concept plan	16.5m (4 storeys) and defined specific heights	16.5m (4 storeys) and defined specific heights	Subject to special rules including the St Lukes precinct
Stoddard Road	Maximums range from 12.5m to 15m	16.5m (4 storeys)	16.5m (4 storeys)	None
Sunnynook	Maximums range from 8m to 9m	16.5m (4 storeys)	16.5m (4 storeys)	None
Takanini	12m	16.5m (4 storeys)	16.5m (4 storeys)	None
Te Atatu (North)	Unlimited	16.5m (4 storeys)	16.5m (4 storeys)	None
Three Kings	Maximums range from 8m to 9m	32.5m (8 storeys)	Maximums range from 16.5m (4 storeys) to 24.5m (6 storey)	None
Warkworth	10.5m	10.5m	Maximums range from 8.5m (2 storeys) to 16.5m (4 storeys)	Subject to special rules including the Warkworth 3 precinct
Wellsford	10.5m	12.5m	16.5m (4 storeys)	None
Whangaparaoa	10.5	16.5m (4 storeys)	16.5m (4 storeys)	None