

**Final Report**

# **Development Contributions: An Empirical Study of Effects**

**Prepared for**

**Waitakere City Council**

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# Executive Summary

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On 1 July 2004, Waitakere City Council (WCC) introduced a development contributions (DCs) policy under the Local Government Act 2002 (LGA02). This replaced some financial contributions (FCs) for infrastructure, which Council previously collected under the Resource Management Act 1991.

As one of the first Council's to adopt a DC policy, WCC had little local experience on which to gauge market reactions. It therefore commissioned Covec to perform an ex-ante evaluation, using a combination of economic theory and information gleaned from interviews with sector participants. The results of our earlier study suggested that:

- Due to the relative strengths of demand and supply, developers would be able to pass on most – if not all – of the additional costs associated with DCs.
- However, any consequent price effects would be minor in context of prevailing market forces.
- As a result, both the average price and number of houses sold were expected to increase during the coming year.
- Due to their regressive nature, any DC-related price effects would be most pronounced at the lower end of the price spectrum, so any affordability impacts would be greatest on lower socio-economic households.

Now, four years on, WCC wish to complement our earlier study with an empirically-focused, ex-post evaluation. This report fulfils that need, and uses a range of empirical methods to test for possible social, economic and environmental effects associated with the introduction of development contributions in Waitakere City. First, however, it sets the scene by estimating the change in total development levies associated with DCs.

In short, we found that, due to offsetting reductions in FCs, the introduction of DCs increased total development levies in Waitakere City by only 25%. The situation for neighbouring Councils was similar, except North Shore, whose total development levies increased 76% post-introduction of DCs.

When placed in context of house prices, we found that Waitakere's post-DC charges were lower than any other Auckland Council (in our sample), and second lowest relative to land values. Hence, market reactions, if any, are not expected to be significant (or prolonged). Any observed effects are more likely to reflect changes in other macroeconomic factors, such as employment, incomes, interest rates and consumer confidence.

This conjecture was later reinforced by our empirical analysis, which suggested that DCs have had no discernible effects on:

- Housing supply,
- Housing affordability, both in terms of house prices and rental values,
- Business investment, and
- Employment growth, even in the construction industry.

We did, however, find weak evidence of a small reduction in the level of residential building consents. Specifically, holding all other factors constant, the introduction of DCs was associated with a 3% reduction in quarterly residential consents. This effect is quite minor, though, especially when compared to interest rates. For example, our analysis suggested that a 10% increase in interest rates causes an 11% reduction in residential consent numbers (all other things being equal).

The only other area where DCs have had any measurable effect is on the level of rates. According to our calculations, the introductions of DCs lowered average annual household rates by around \$27 (compared to the rates that would have been required absent DCs). However, this effect is small, and the calculations somewhat uncertain.

This report also considered the extent to which WCC's DC policy encourages economic efficiency via spatial variation in charges. Put slightly differently, it examines the level of charges prevailing in different parts of the city, and reconciles these with capital costs. We find that, despite some initial anomalies, WCC's levies adequately reflect variation in cost, and are structured to help contain urban sprawl.

Finally, this report takes a step back from empirics, and summarises (i) developer perceptions of local authorities, and (ii) issues that developers consider of greatest importance when selecting development locations. It draws on the survey from our earlier report, plus a recent report by MOTU entitled *Housing Supply in the Auckland Region 2000-2005*. We also conducted follow-up interviews with survey participants from our earlier report to gauge current perceptions of developing in Waitakere and, therefore, dealing with Waitakere City Council. The results are somewhat alarming, but must be considered in light of respondents' inevitable vested interests.

In general, developers – and other participants in the property development process - are displeased with the service that they receive from WCC. Specific concerns include:

- Consent processing times are woefully slow, resulting in dramatic and costly delays. Moreover, there is an overwhelming feeling that Council does not understand the grave financial and logistical implications of delay.
- Communication with staff is made difficult by several factors. First, there is a number of good staff but they tend to be turned over quickly, resulting in losses of continuity and even greater time delays. Second, there are often multiple points of contact, making it difficult to know who to contact at any given point in time. Third, Council officers are very poor at returning calls. Fourth, there appears to be a lack of co-ordination between departments, resulting in confusing and mixed messages. Fifth, many staff are foreign-speaking, and do not communicate clearly.
- A few respondents also noted that consent conditions are far too prescriptive. They felt that Council should focus more on outcomes or effects, not processes.

Similar sentiments were echoed in the MOTU report (which canvassed opinions across the Auckland region) but the strength of feeling in Waitakere was immense. On the basis of this information, we suggest that Council consider reviewing its consent processing procedures, and possibly include developers in a roundtable discussion to reach a mutually-agreeable position. Failure to do so could conceivably undermine Council's growth aspirations for the future.

# 1. Introduction

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## 1.1. Purpose

This report uses a range of empirical methods to test for possible social, economic and environmental effects associated with the introduction of development contributions in Waitakere City.

## 1.2. Background

On 1 July 2004, Waitakere City Council (WCC) introduced a development contributions (DC) policy under the Local Government Act 2002 (LGA02). This replaced some financial contributions (FCs) for infrastructure, which Council previously collected under the Resource Management Act 1991.

As one of the first Council's to adopt a DC policy, there was little experience on which to gauge possible market reactions. WCC therefore commissioned Covec to perform an ex-ante evaluation using a combination of economic theory, and information gleaned from interviews with sector participants.<sup>1</sup> Now, four years on, WCC wish to complement that earlier study with an empirically-focused ex-post evaluation.

## 1.3. Summary of Earlier Report

Our earlier study suggested that:

- Due to the relative strengths of demand and supply, developers would be able to pass on most – if not all – of the additional costs associated with DCs.
- However, any consequent price effects would be minor in context of prevailing market forces.
- As a result, both the average price and number of houses sold were expected to increase during the coming year.
- Due to their regressive nature, any DC-related price effects would be most pronounced at the lower end of the price spectrum, so any affordability impacts would be greatest on lower socio-economic households.
- Effects on rents, if any, would be delayed as prices are fixed until renewal time.
- Development contributions were expected to reduce Council's debt servicing costs by nearly \$34 million over the life of the LTCCP.
- Development contributions were expected to improve economic efficiency and intergenerational equity, at least to some extent.

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<sup>1</sup> A summary of the findings of our earlier report are provided in the following subsection.

## 1.4. Scope of this Report

Although the possible effects of DCs are far-reaching, this report focuses only on those that are both material and quantifiable. As a result, it focuses primarily on social and economic impacts. Cultural and environmental impacts are difficult both to define and to measure.

## 1.5. Structure of this Report

The remainder of this report is structured as follows:

- *Section two* outlines a number of background issues that needed to be addressed during the course of this project.
- *Section three* estimates changes in the relative cost of construction associated with the introduction of DCs in Waitakere City.
- *Section four* considers possible effects on the rate of housing supply.
- *Section five* analyses the potential impacts of DCs on housing affordability, both in terms of house prices and rental values.
- *Section six* covers possible impacts on business investment.
- *Section seven* estimates prospective employment effects.
- *Section eight* considers any environmental impacts caused by DCs.
- *Section nine* estimates the impacts of DCs on the level of rates in Waitakere City.
- *Section ten* complements the empirical analysis by summarising developer perceptions of various development aspects, and highlights perceived issues with Waitakere City Council.
- *Appendix one* presents the developer questionnaire used during this project.
- *Appendix two* summarises the results of various regression analyses.

## 2. Issues to Address

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Three major issues needed to be addressed during the course of this project. First, in order to understand the true cost implications of DCs, we needed to take account of any consequent reductions in other development levies. Second, because we wished to isolate effects associated with these changes in relative price, we needed to somehow control for other factors that may be at work. Third, the use of time series data - which underlie this analysis – raises a special set of modelling issues.

This section provides a brief overview of how each issue was addressed.

### 2.1. Determining Changes in Relative Price

In our earlier study, which was completed in 2004, time and budget constraints precluded us from taking account of the effects that DCs had on the level of financial contributions. As a result, our report overstated the actual change in relative cost caused by the introduction of DCs.

In this report, we explicitly take account of changes to financial contributions so that a more accurate measure of relative price changes is used.

### 2.2. Controlling for Confounding Effects

Having accurately measured the change in relative prices caused by the introduction of DCs, we then needed a method for tracing any consequent effects. This is made difficult by the myriad other forces that simultaneously impact on property markets. For instance, an observed decrease in the rate of construction may reflect increasing interest rates and/or the effects of DCs or, indeed, a host of other factors. At face value, there is no easy way to tell.

This report uses two basic strategies to overcome such ‘confounding effects.’<sup>2</sup> First, where possible, we use econometrics. This allows us to explicitly hold constant every other factor that may play a role (provided they are included in the analysis itself). Second, where the application of econometrics was impracticable, we control for external factors by benchmarking Waitakere against other Auckland councils that have been exposed to the same economic factors over time.

With regards to the latter, we formed a hypothetical ‘study area’ comprising Rodney, Auckland City, North Shore and Manukau. Franklin and Papakura were omitted because they were too distant, and also perceived to cater to materially-different markets, to Waitakere City.

### 2.3. Working with Time Series Data

Two major issues arise when undertaking econometric analyses of time series data. The first relates specifically to data, and the other to econometrics more generally.

#### 2.3.1. Spurious Regression

Since the data we wish to analyse are time series, we must be careful to avoid the ‘spurious regression’ problem. This can arise when two or more time series variables are successfully

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<sup>2</sup> It is important to note that neither of these ‘solutions’ is perfect, so one must apply caution when interpreting results. Statistical analysis really allows us only to identify associations and correlations, not causation.

regressed on one another, despite having no causal relationship. A commonly-cited example is a regression of ice cream sales on shark attacks – the two are closely related (as they both peak in summer) but clearly are unrelated.

In technical terms, spurious regressions result from the use of time series data whose mean and/or variance changes over time. Such data are said to have ‘unit roots’, and must be transformed (or handled very carefully) to avoid the pitfall outlined above. The first step in our analysis therefore was to test for the presence of unit roots, and to manipulate the data accordingly.

### 2.3.2. Model Selection

The other major modelling issue impacting this study was that there can simply be too many models to choose from. In other words, for any given set of variables, there are numerous ways that they can be combined and analysed.

Our general approach is to start from first principles, and use economic theory to derive possible functional forms. Each is then subjected to a range of tests to examine strengths and weaknesses. In order to make this process as objective as possible, we constructed a list of criteria against which each model could be assessed. These included:

- The theoretical consistency of the sign and magnitude of estimated coefficients. This is perhaps the most important criterion.
- Measures of goodness of fit. These include:
  - $R^2$ , which measures the percentage of variation in the dependent variable explained by variation in the independent variables.
  - The statistical significance of coefficient estimates (as measured by p-values)
  - Plots of actual values against fitted values.
- Within-sample forecasting accuracy. This involves truncating the sample and then comparing the model’s forecasts with actual observations at the end of the sample.
- The presence of co-integration (which indicates the absence of spurious regression).
- The Breusch-Godfrey test for serial correlation.

## 3. Effects on Relative Prices

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### 3.1. Objective

The objective of this section is to determine the extent to which development contributions altered the relative prices of development in Auckland region.

### 3.2. Approach & Data

Using data compiled from District Plans, LTCCPs and discussions with Council officers, we estimated the total 'development levies' payable in each city immediately before and after the introduction of development contributions.

For the purposes of this exercise, development levies were defined as financial contributions (FCs) plus development contributions (DCs). Any other levies, such as resource consent fees, were excluded on the basis of materiality. Furthermore, because both FCs and DCs vary *within* each city or district, we have taken averages of the highest and lowest charges to arrive at a single figure for each area.<sup>3</sup>

Finally, because there is little geographic variation in construction costs, and because development contributions may be levied prior to construction (such as at subdivision stage), we exclude them from our analysis. Instead, we focus on the size of development levies in relation to (i) land values, and (ii) median house prices.

### 3.3. Results

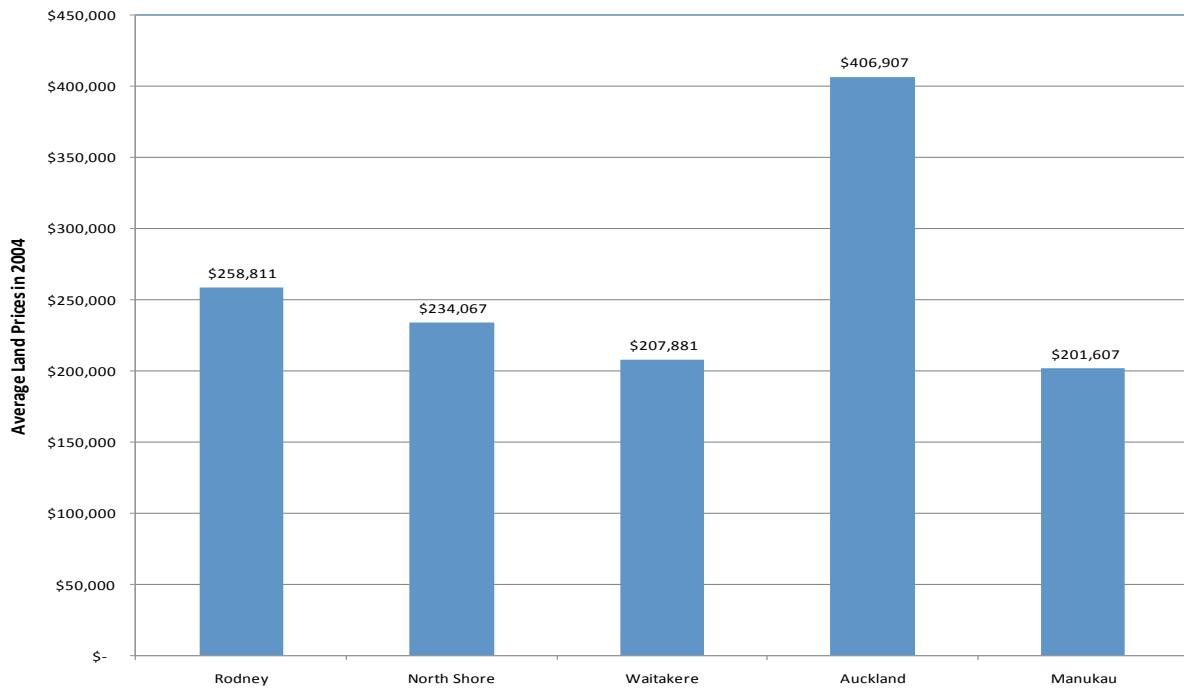
#### 3.3.1. Land and House Prices

Land values and median house prices were gleaned from a recent MOTU report entitled *Housing Supply in the Auckland Region 2000-2005*. This provided point estimates for 2000 and 2005. Using linear interpolation, we derived estimates for 2004 to align with the date that DCs were introduced in Waitakere City. Our results are shown in the figures below.

According to Figure 1, residential land values in 2004 ranged between \$202,000 (in Manukau) and \$407,000 (in Auckland City). The average value in Waitakere was near the bottom of the range, at \$208,000.

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<sup>3</sup> Reserves contributions were calculated using average land values for each area.

**Figure 1: Average Land Values in 2004**

The distribution of house prices closely mirrored that of land values, except in North Shore City, where house prices were much higher in relation to the value of land. Auckland City once again had the highest value (at \$469,000), while Waitakere had the lowest (at \$293,000). This difference in value reflects, at least partially, variations in average house size. This can be seen in Figure 3, which plots average household sizes (as disclosed in building consents).

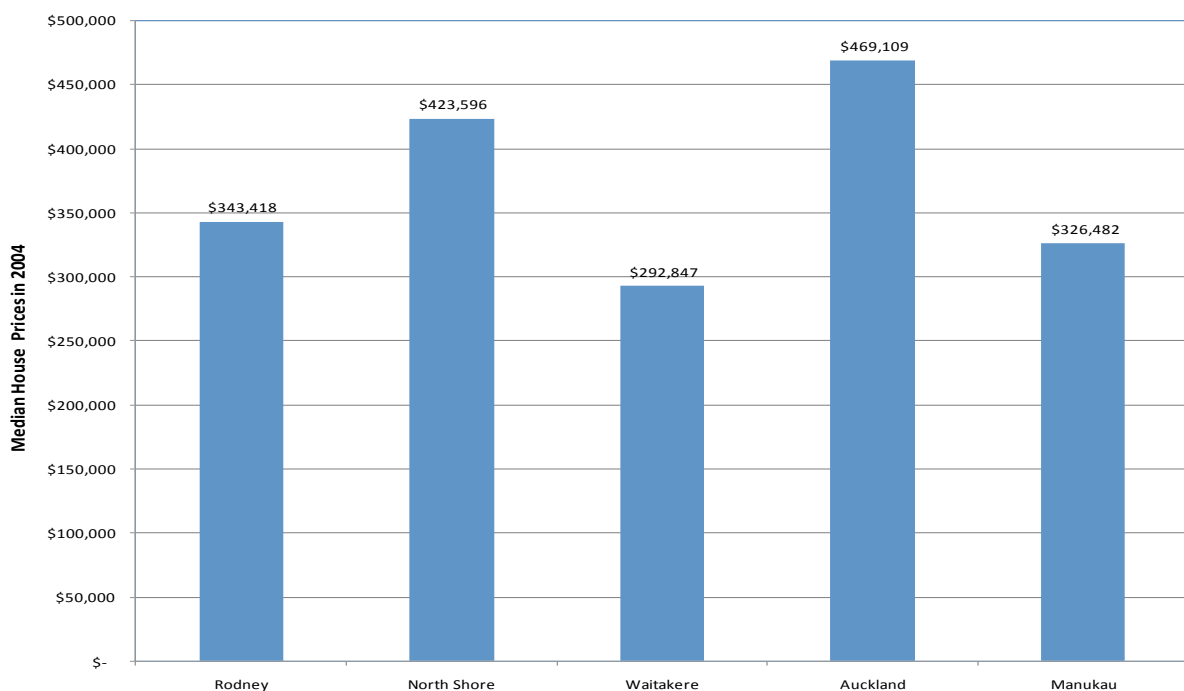
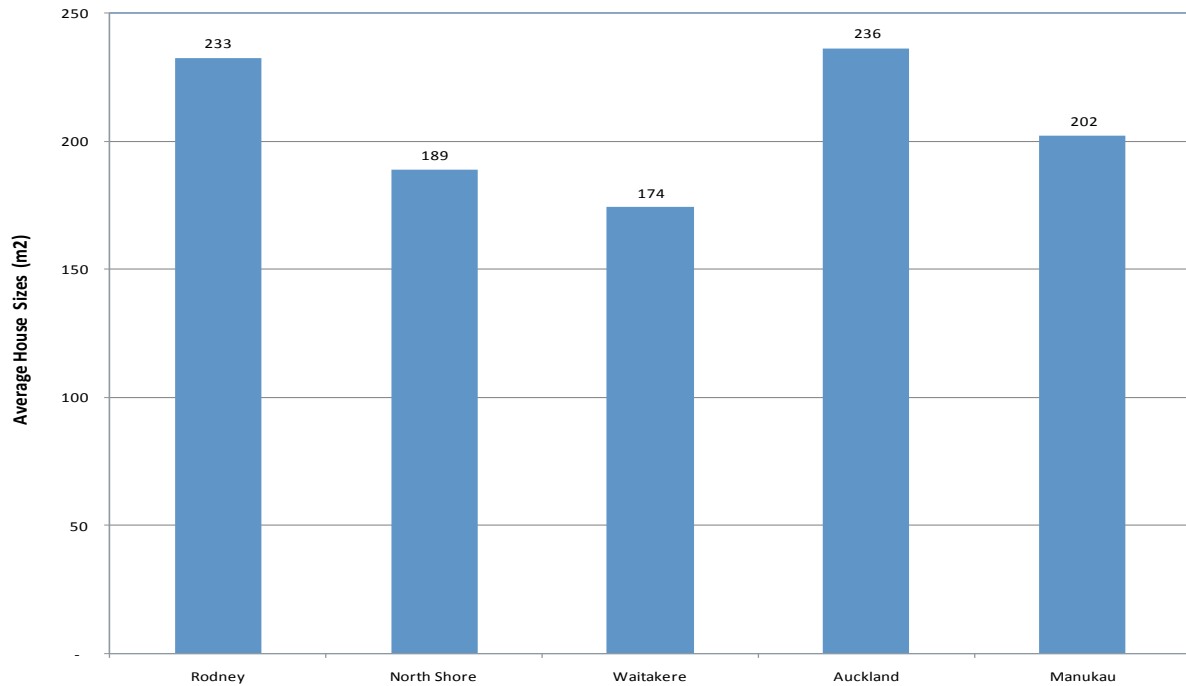
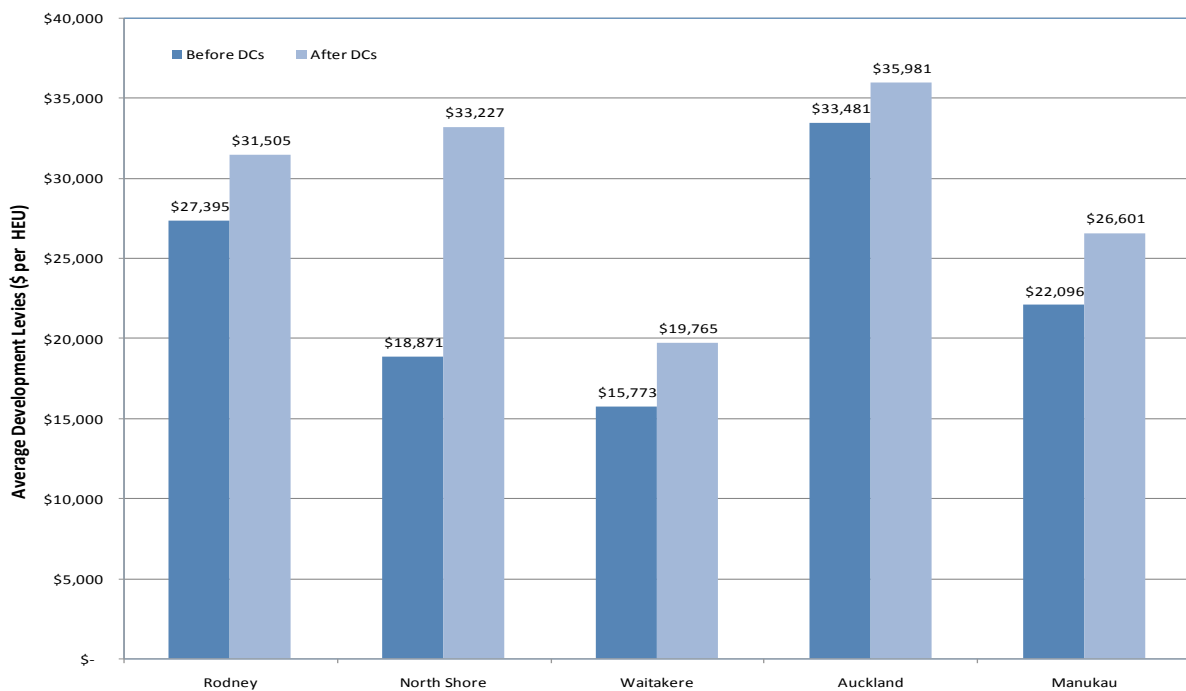
**Figure 2: Median House Prices in 2004**

Figure 3: Average House Sizes (m<sup>2</sup>)

### 3.3.2. Development Levies (before and after DCs)

Figure 4 plots average development levies (*i.e.* FCs + DCs) before and after the introduction of DCs. Please note that Rodney is yet to adopt a development contributions policy, but has been included due to its proximity to Waitakere. The charges shown for Rodney are those that applied immediately before and after the adoption of Plan Change 62 (in April 2005).

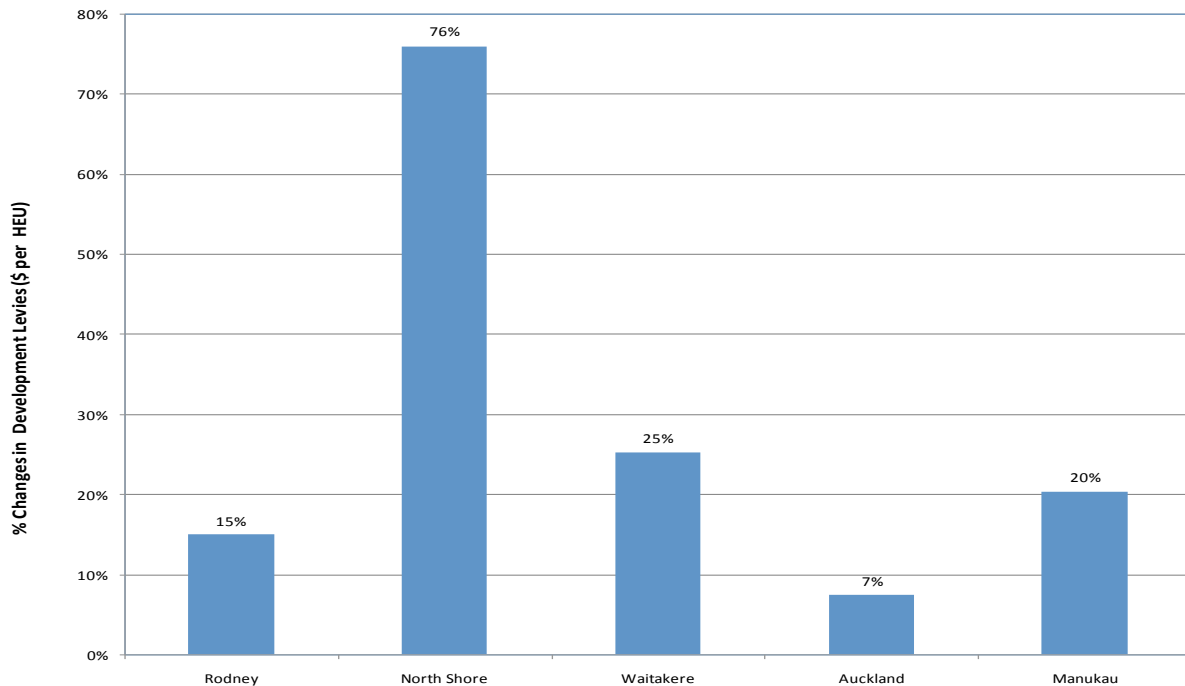
Figure 4: Development Levies (FCs + DCs) Before and After DCs



According to Figure 4, Waitakere's development levies (*i.e.* FCs + DCs) were lower than its peers both before and after the introduction of DCs. In fact, the WCC 'before DCs' charge was 53% lower than Auckland City's, while the 'after' charge was 45% lower. Waitakere's charges are, therefore, modest compared to its neighbours.

Figure 5 translates these sets of charges into percentage changes. Clearly, the increase at North Shore is the most significant, and the increase at Auckland the least significant. The total increase in development levies in Waitakere associated with DCs is around 25%.

**Figure 5: % Change in Development Levies**

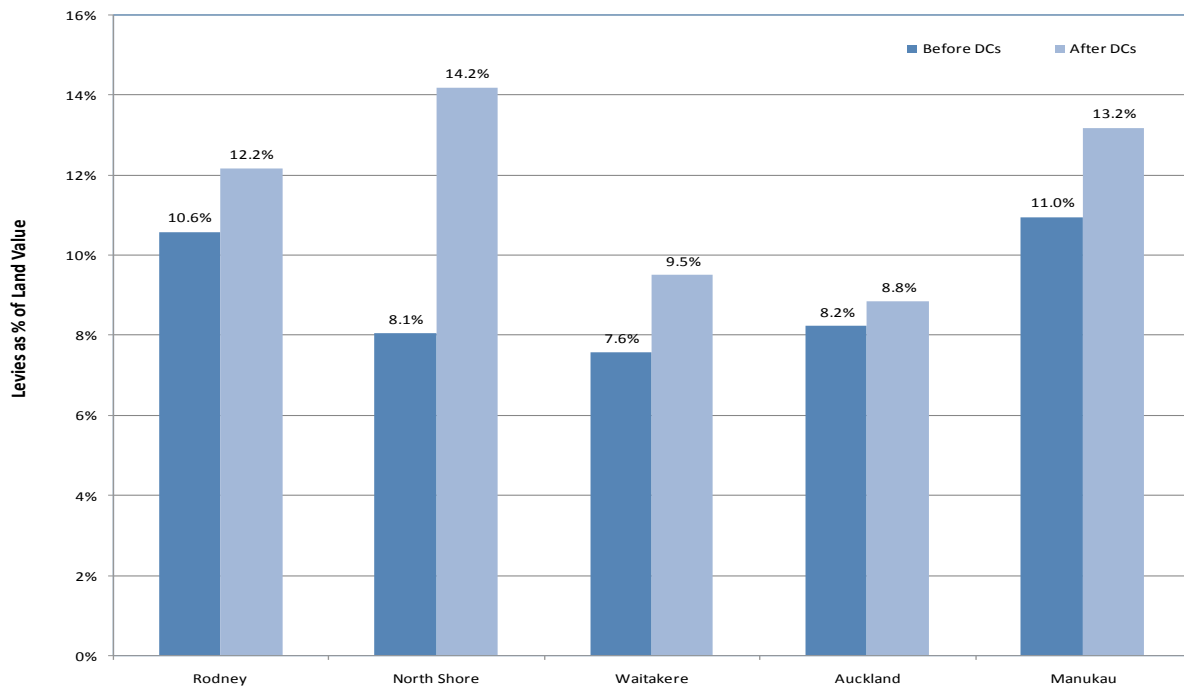


### 3.3.3. Levies Relative to Land Values

The following figure expresses each area's charges (both before and after DCs) as percentages of average land values.

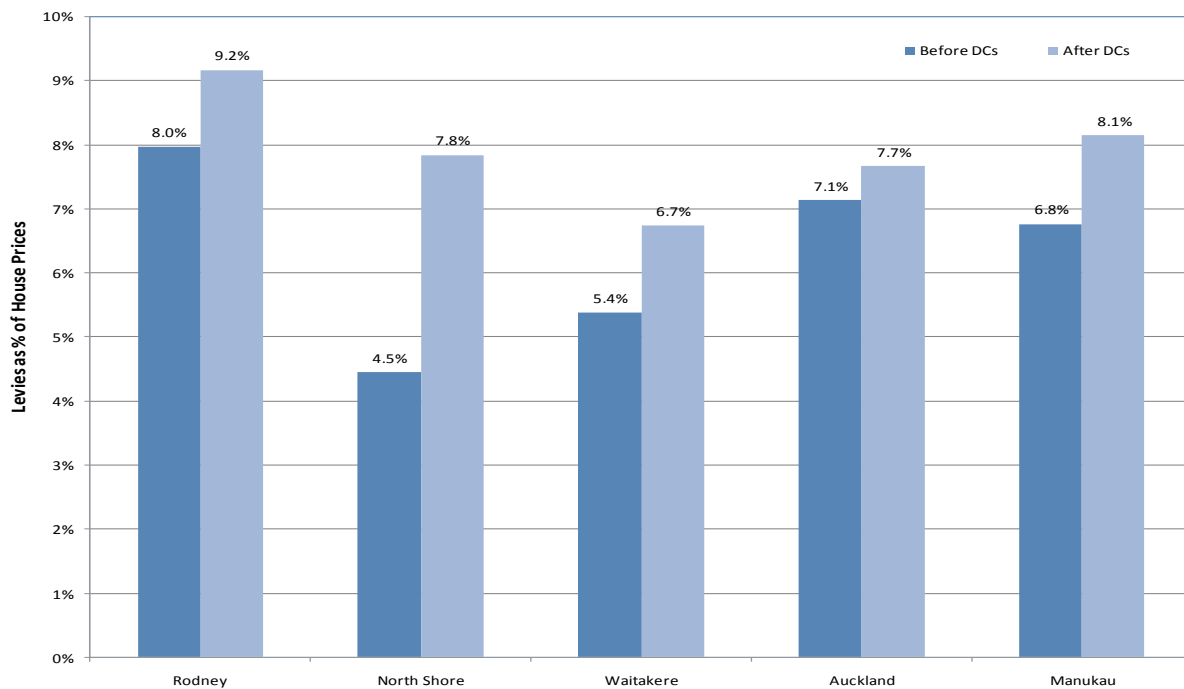
When expressed in this way, Waitakere's charges appear quite cheap. Indeed, prior to the introduction of DCs, Waitakere's charges were a lower fraction of land value than any of its neighbours. Post-introduction, it remained the cheapest save for Auckland City.

The post-DC charges in Rodney, North Shore and Manukau are significantly higher, all exceeding 12% of land value.

**Figure 6: Development Levies as % of Land Values**

### 3.3.4. Levies relative to House Prices

Finally, we express each area's charges as percentages of house prices, to understand the potential impact on consumers (who ultimately bear the cost of development levies).

**Figure 7: Development Levies as % of Median House Prices**

Pre-DCs, Waitakere's charges were a lower fraction of house prices than all its neighbours except North Shore City. Post-introduction, they are lower than all its peers.

### 3.4. Conclusions

Prior to the introduction of DCs, Waitakere's development levies were low compared to other Auckland Councils. Despite increasing 25% post-introduction of DCs, Waitakere's development levies remained low both in absolute and relative terms. In fact, Waitakere's post-DC charges were a lower fraction of house prices than any other Auckland Council (in our sample) and second lowest relative to land values. Hence, market reactions, if any, are not expected to be significant (or prolonged). Any observed empirical effects are more likely to reflect changes in other macroeconomic factors, such as employment, incomes, interest rates and consumer confidence.

# 4. Effects on Housing Supply

## 4.1. Objective

One of the central aims of this report is to identify whether DCs have affected housing supply in Waitakere. This section addresses that question.

## 4.2. Approach & Data

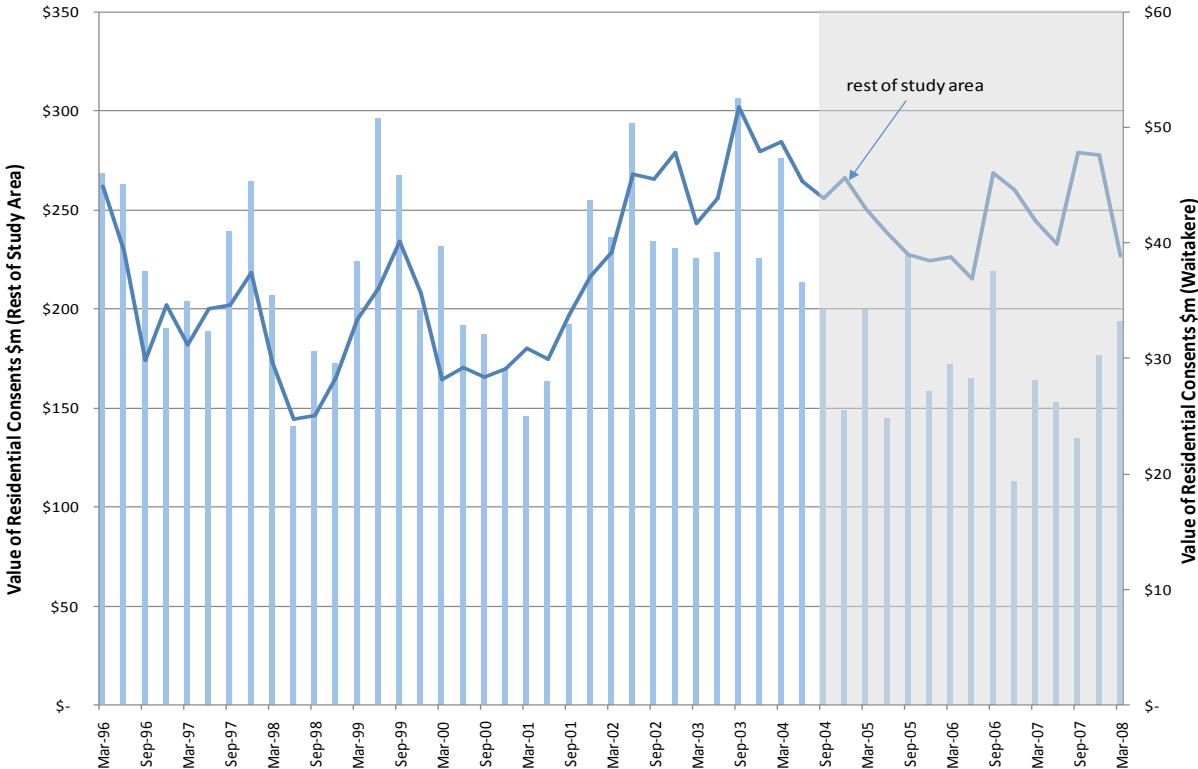
Using detailed building consent data from Statistics New Zealand, and applying standard econometrics (time-series) techniques, we test for the presence of ‘structural breaks.’ These signify shifts in planned construction activity as a result of DCs. First, however, we present the data underlying our analysis to provide some context.

For ease of exposition, we split the analysis into two parts. First, we consider potential impacts on consents for stand-alone dwellings (*i.e.* houses), then we move on to consents for apartment, flats and units.

### 4.2.1. House Consent Data

Figure 8 presents the value of quarterly new dwelling consents since 1996. The bars denote consents for Waitakere City, while the line collectively represents consents for the remainder of the study area - Rodney, North Shore, Manukau and Auckland. The shaded area represents the date at which DCs were introduced in Waitakere.

Figure 8: Total Value of Quarterly Consents (\$m)



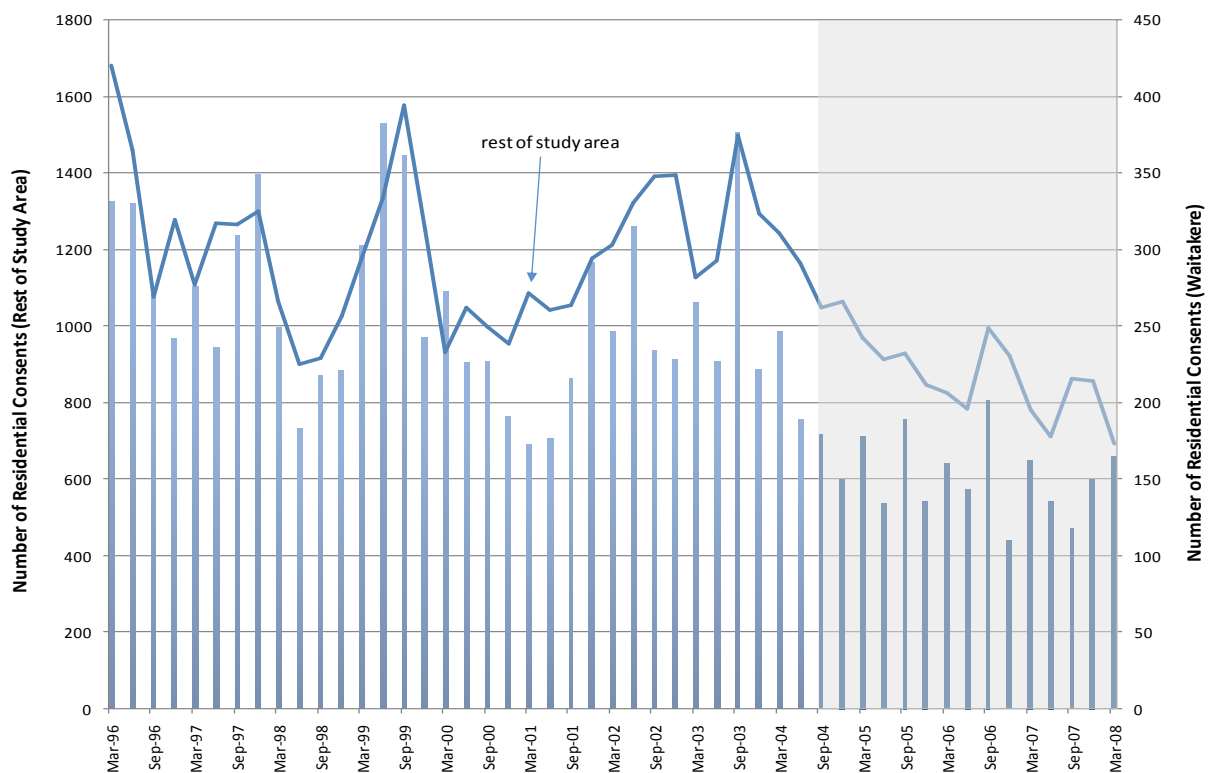
According to Figure 8, consent values in Waitakere followed the same general trends as elsewhere up to around March 2004, after which they diverge. But, what is the mechanism via which this effect manifests? Does it reflect a reduction in the number, size and/or average value of consents? This can be answered by decomposing consent values into their constituent parts, as follows:

$$\text{Quarterly Consent Value} = \text{Number} \times \text{Average Size} \times \text{Average Value}$$

This equation relates consent values to (i) the number of consents, (ii) their average size, and (iii) the average value. It allows us to identify which component(s) are the primary drivers of observed trends.

Now, we look at trends in each of these component parts to learn more about the trends in Figure 8. We start with consent numbers.

Figure 9: Quarterly Consent Numbers



According to Figure 9, there has been a fairly steady decline in the number of consents, both in Waitakere and elsewhere. In fact, the number of consents has fallen 56% in Waitakere and 54% elsewhere since the peak in September 2003. These are dramatic reductions, indeed.

Next we consider trends in average consent size (m<sup>2</sup> per dwelling).

**Figure 10: Average Size of Consents -m<sup>2</sup> per dwelling**

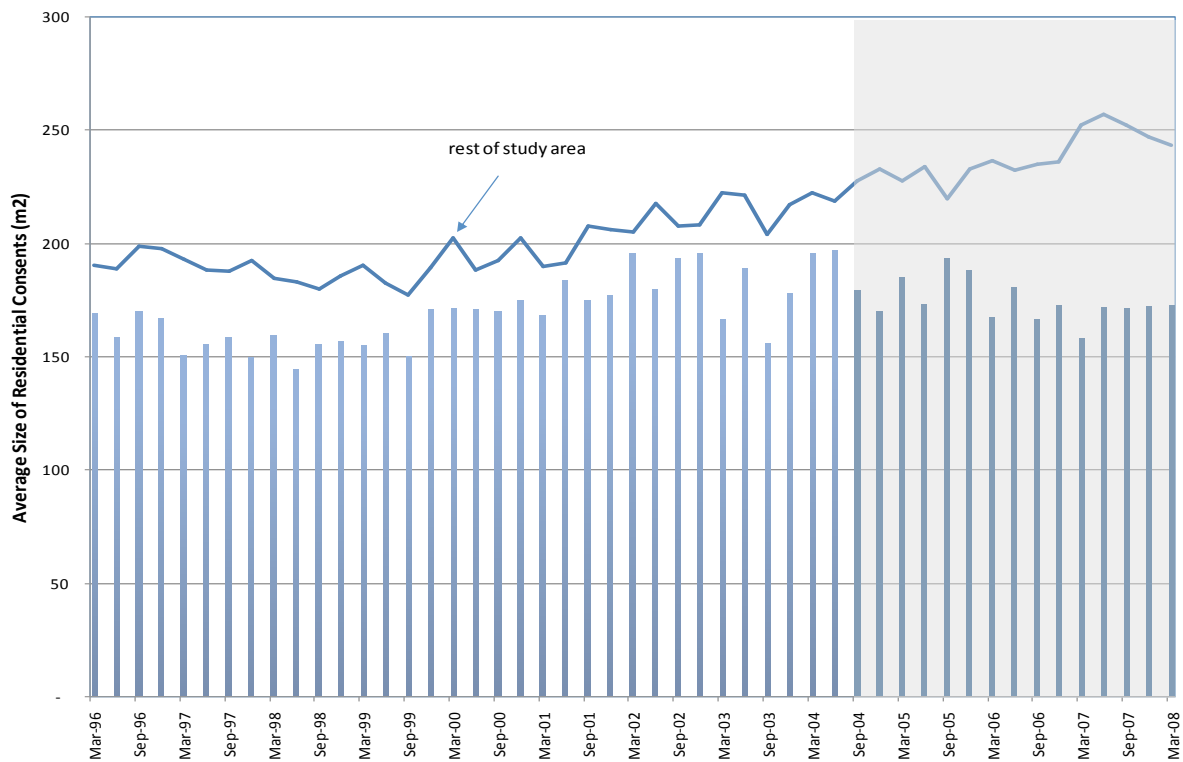
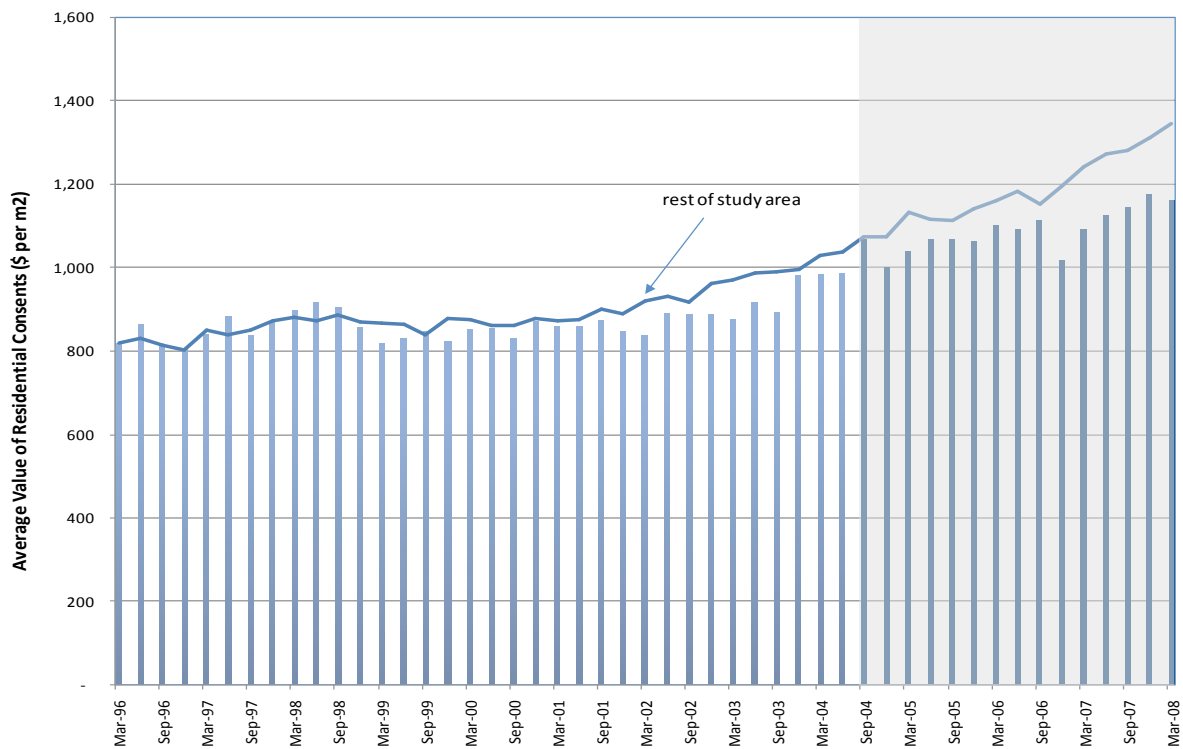


Figure 10 shows that, despite large reductions in the number of consents, the average size of dwellings has steadily risen (from 187m<sup>2</sup> in 1996 to 230m<sup>2</sup> in 2008). A small drop in size is evident over the last 12 months, however. Finally, we look at trends in value per square-metre.

**Figure 11: Average Value of Consents - \$ per m<sup>2</sup>**



Like average dwelling sizes, the average value of consents (per m<sup>2</sup>) has increased over time. In fact, since 1996, it has increased 42% in Waitakere and 64% elsewhere.

### Conclusion

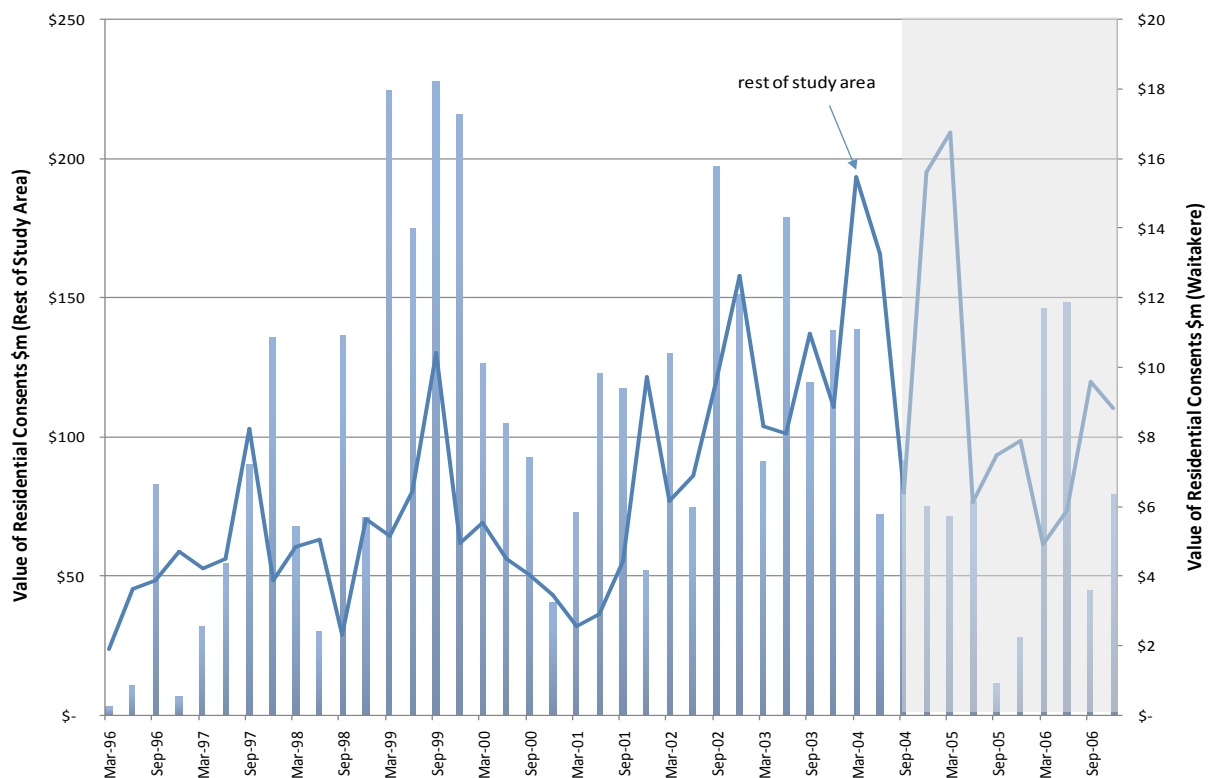
There have been steady falls in consent value since September 2003 in both Waitakere and other parts of Auckland. This is driven almost-exclusively by sharp declines in the number of consents. Our econometric analysis therefore focuses on the extent to which DCs have affected consent numbers, rather than average sizes or average values.

We now turn our attention to consents for apartments, flats and units.

### 4.2.2. Apartments

Figure 12 presents the value of quarterly residential consents for apartments, flat and units (hereafter 'apartments'). As before, the bars represent Waitakere City, while the line jointly-represents Rodney, North Shore, Manukau and Auckland. The shaded area, again, represents the date at which DCs were introduced in Waitakere.

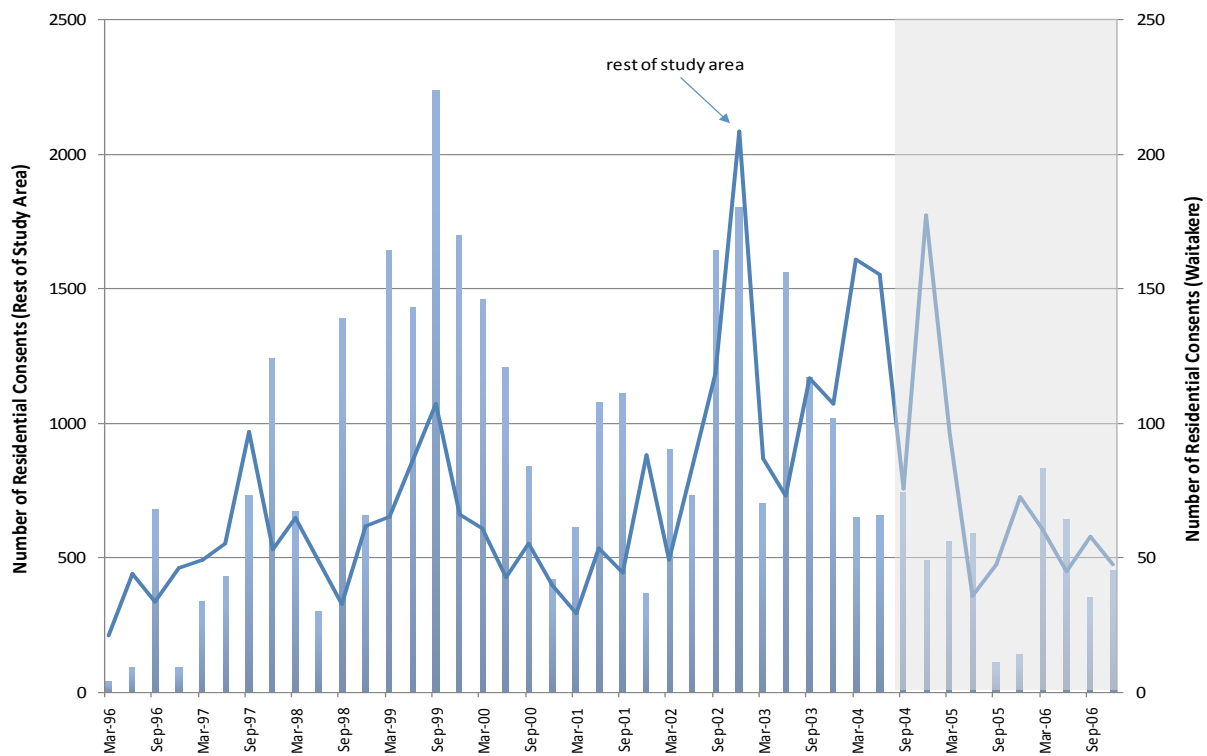
Figure 12: Total Value of Quarterly Consents (\$m)



According to Figure 12, consent values in Waitakere have been fairly constant (on average) throughout the period, while elsewhere they have crept up over time. Both areas suffered major blows around early 2005, however.

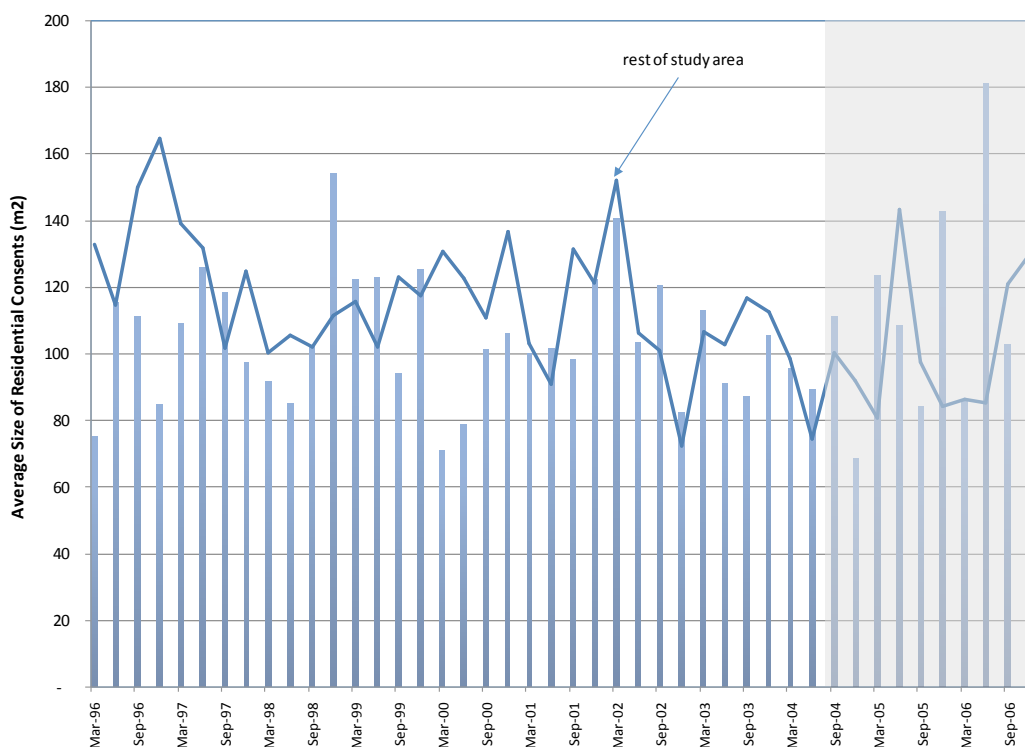
As with house consents, we now analyse trends in numbers, sizes and average values to glean more information.

**Figure 13: Quarterly Consent Numbers**



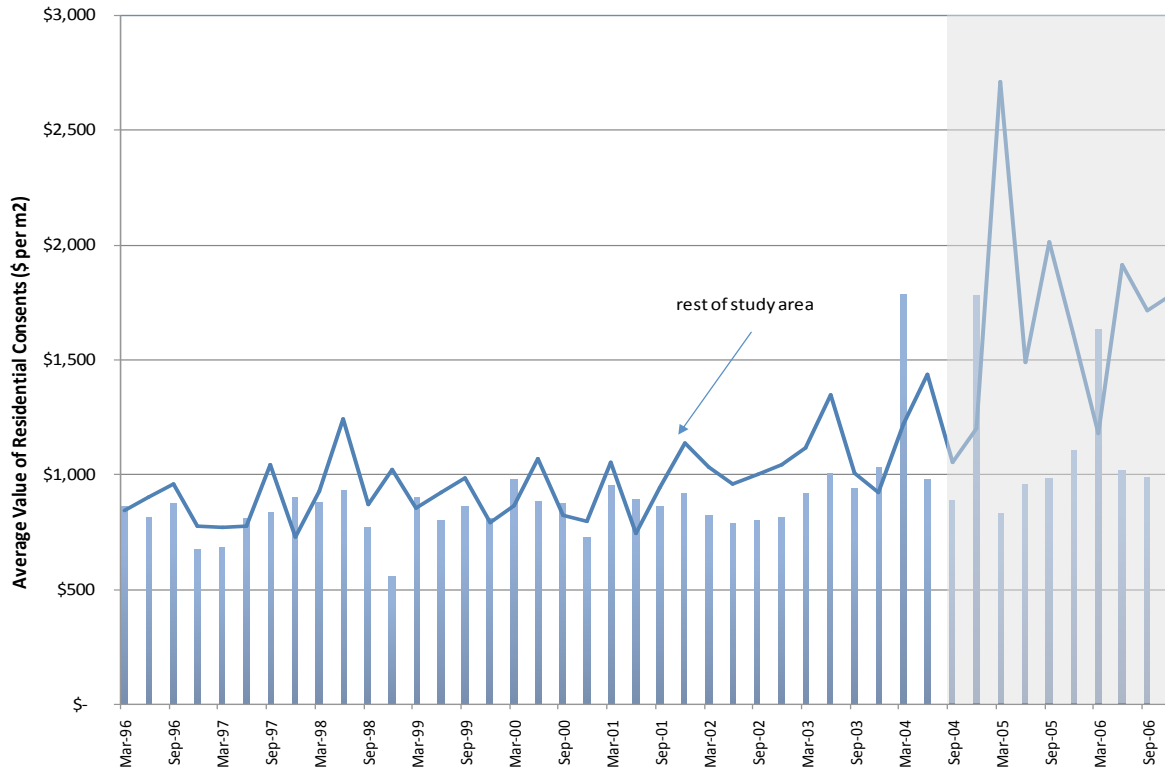
As one might expect, trends in consent numbers closely mirror those of consent value. Namely, the long-run average in Waitakere is relatively constant, while elsewhere it has risen over time. Also, just like total consent values, consent numbers suffered a sharp decline in early 2005 (both in Waitakere and elsewhere). Now, we look at average sizes.

**Figure 14: Average Size of Consents -m2 per unit**



According to Figure 14, trends in average apartment sizes are pretty similar in Waitakere as elsewhere in Auckland. Specifically, they have been pretty static over time. Finally, we look at trends in value per square-metre.

**Figure 15: Average Value of Consents - \$ per m2**



According to Figure 15, average values (per square-metre) have been fairly stable in both Waitakere and elsewhere. However, between late 2004 and early 2005, they increased 126% in Rodney, Manukau, North Shore and Auckland. The precise reason for this is unknown.

### Conclusion

Consents for apartments appear far more volatile than consents for houses. Nevertheless, both show reductions in numbers and values in recent times. We now turn to our econometric analysis to seek a deeper understanding of these trends.

## 4.3. Econometric Results

### 4.3.1. Models – Houses

Now we introduce the various models constructed to ‘explain’ housing consents trends in Waitakere City. We start with models of consent value.

#### *Basic Model of Consent Value*

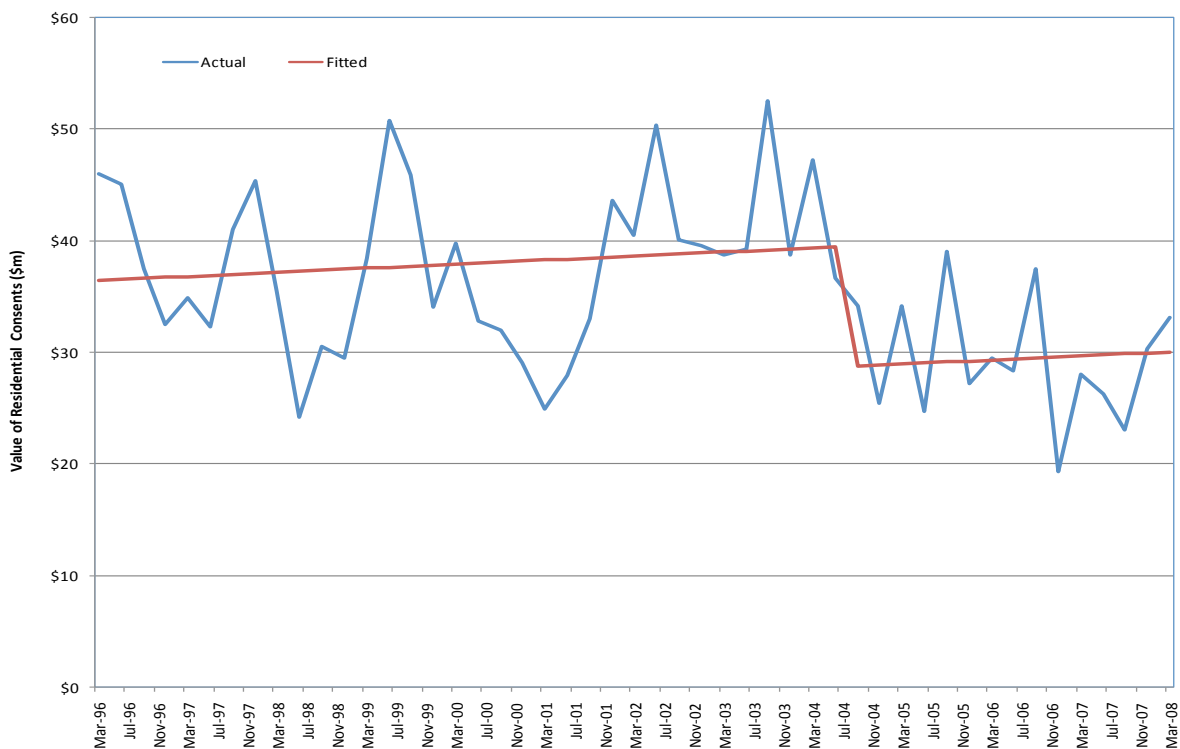
First, we sought a very simple model to test whether DCs had any effect on consent values. The equation we used is set out below:

$$\text{Consent Value} = \text{constant} + \text{time trend} + \text{DCs}$$

This equation comprises a constant and linear trend, plus an additional term (DCs) that takes on the value 0 before 1 July 2004, and 1 thereafter. The latter allows us to test for DC-related structural breaks. A chart of fitted values is reproduced below.

As we can see, the model accurately captures the drop in value in 2004, but fails to adequately explain inter-period variation. This led us to construct a more detailed model, as discussed below.

**Figure 16:** Fitted Values from Simple model of House Consent Values



#### *Detailed Model of Consent Value*

In order to derive a more accurate model of consent value, we augmented our basic model with a range of economic variables. These included measures of GDP, migration and interest rates. We also expanded the 'constant' to allow for seasonal variation. This proved to be significant. The final form of our consent value model is shown below.

$$\log(\text{Consent Value}) = \text{Season} + \text{trends} + \text{lagged interest rates} + \text{DCs}$$

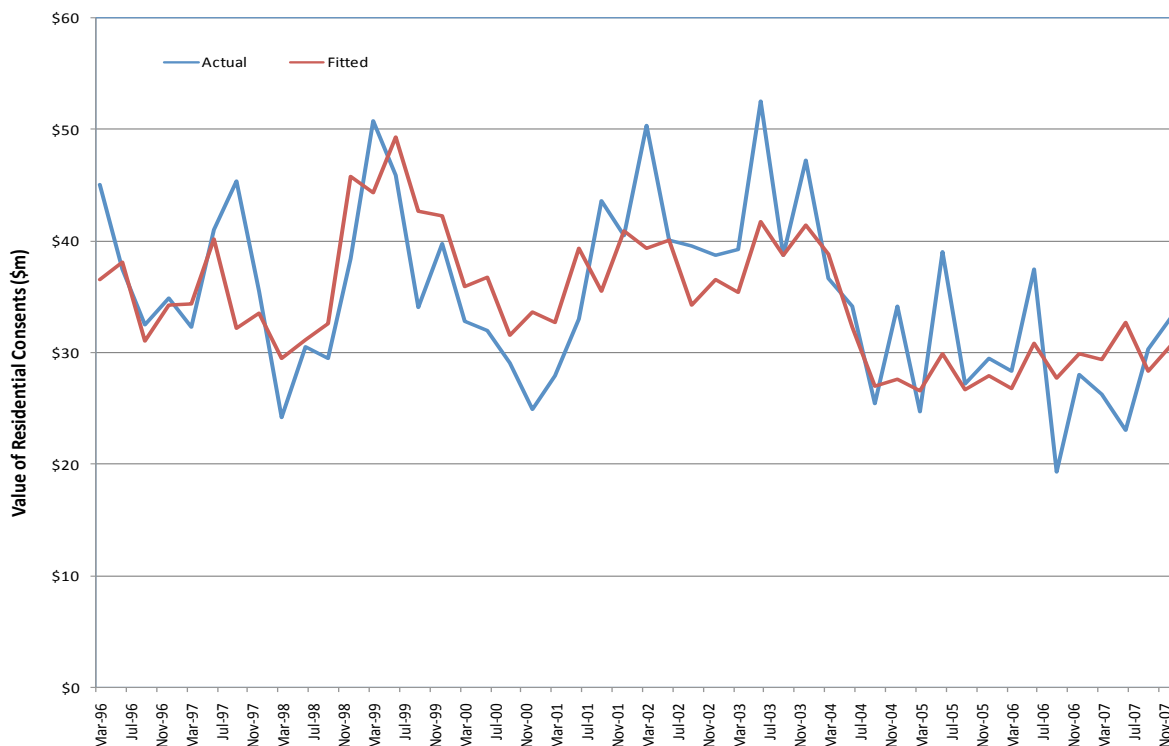
A copy of the regression output follows.

**Table 1:** Regression Output for Detailed Value Model

Variable	Coefficient	Std. Error	t-Statistic	Prob.
Summer	19.741	0.65	30.54	0.000
Autumn	19.703	0.65	30.35	0.000
Winter	19.821	0.65	30.31	0.000
Spring	19.689	0.65	30.10	0.000
Linear trend	-0.032	0.01	-2.53	0.015
Non-linear trend	0.001	0.00	2.53	0.015
Lagged interest rates	-0.950	0.26	-3.68	0.001
DCS	-0.273	0.12	-2.26	0.029
R <sup>2</sup>	51%			
Adjusted R <sup>2</sup>	42%			
Serial correlation test	passed			

According to the table above, quarterly consent values in Waitakere City have followed both linear and non-linear trends, and also exhibit seasonal patterns. Moreover, they appear to be quite strongly influenced by interest rates, with a 10% increase in interest rates leading to a 9.5% decrease in consent values. Finally, the results suggest a small negative effect of DCs on consent values. Specifically, holding all other factors constant, the introduction of DCs appears to have reduced quarterly consent values by 2.7% (although this is of borderline statistical significance).

The fitted values generated by this model are compared with actual values in the chart below.

**Figure 17:** Fitted Values from Detailed model of House Consent Values

Looking at the two lines in the chart above, we can see that the model tracks actual values fairly well, but does a poor job of picking highs and lows.

As noted in the previous subsection, the recent downturn in Waitakere consent values is driven largely by reductions in consent numbers. Our next task therefore was to derive econometric models of these. A discussion of our efforts is summarised below.

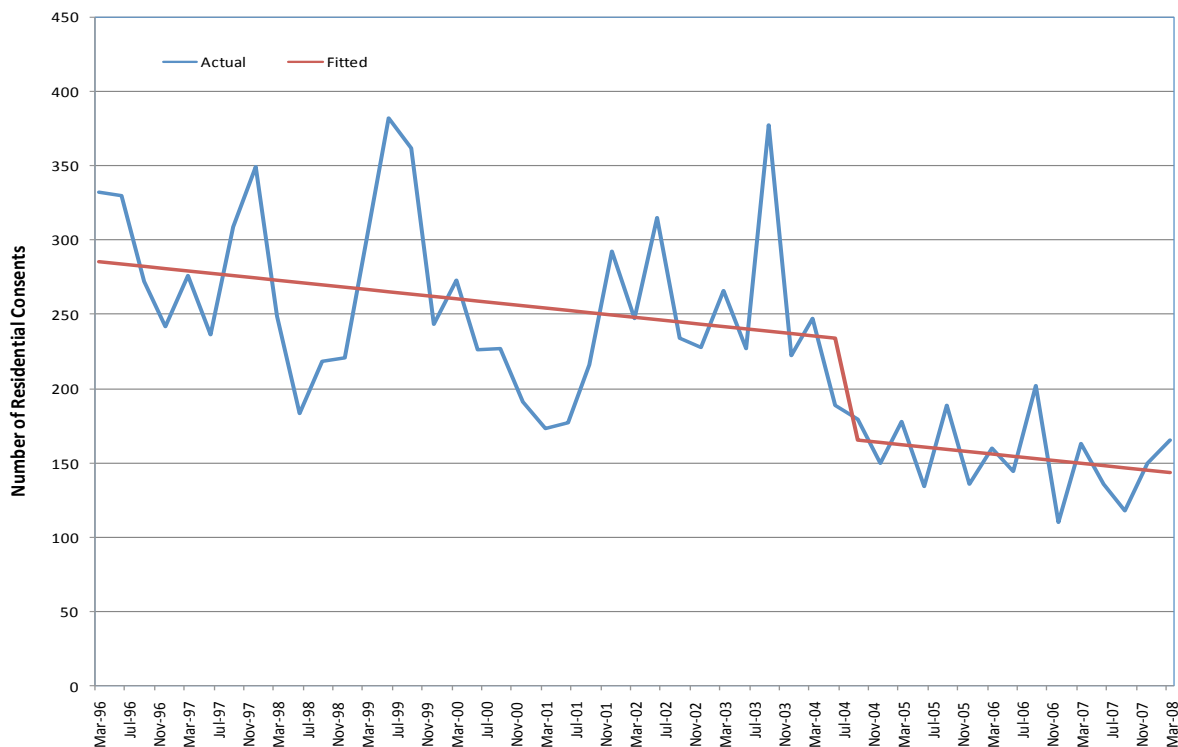
#### *Basic Model of Consent Numbers*

Replicating our general approach to analysing consent values, we first constructed a basic model of consent numbers. The equation that we estimated was:

$$\text{Consent Number} = \text{constant} + \text{time trend} + \text{DCs}$$

A chart of fitted values is reproduced below.

**Figure 18: Fitted Values from Simple model of House Consent Numbers**



Like the basic model of consent value, our basic model of consent numbers accurately captures the drop in 2004, but fails to adequately other periods of variation. This, once again, led us to construct a more detailed model.

#### *Detailed Model of Consent Numbers*

Our detailed model of consent numbers was derived in a similar fashion to that of our detailed value model - by testing a range of additional (economic) explanatory variables, and adding a collection of seasonal variables. The final form of our consent numbers model is shown below.

$$\log(\text{Consent Number}) = \text{Season} + \text{trends} + \text{lagged interest rates} + \text{DCs}$$

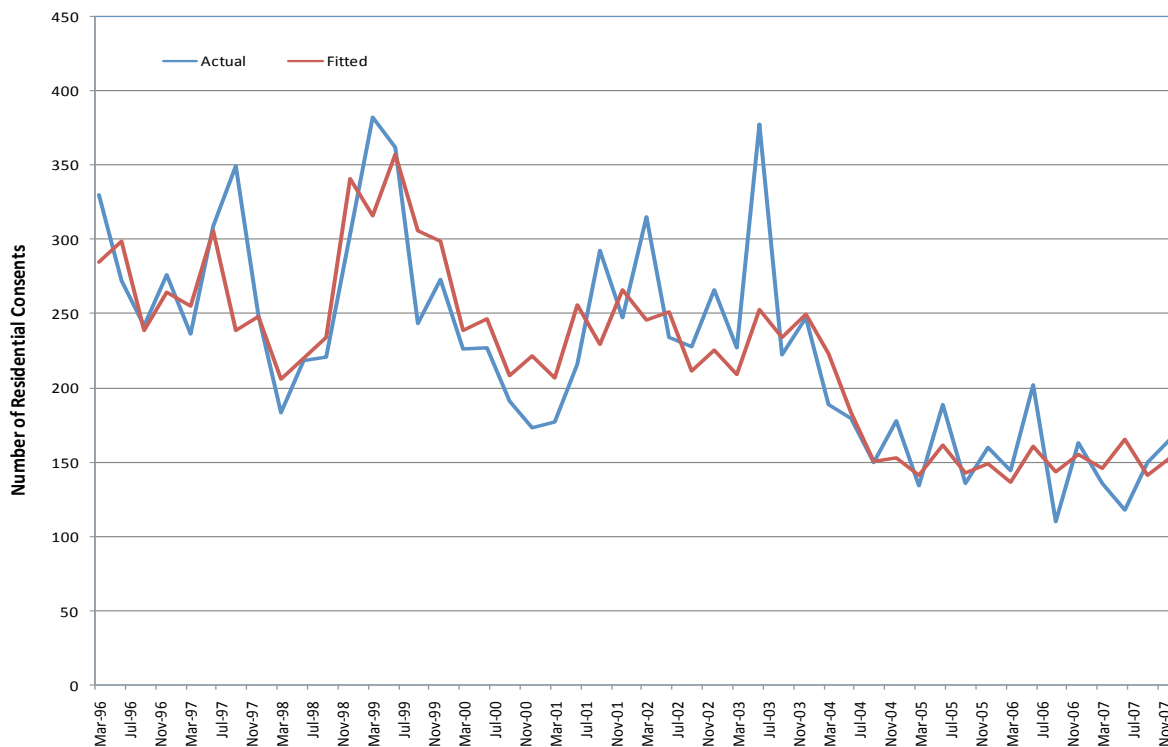
A copy of the regression output follows.

**Table 2:** Regression Output for Detailed Consent Numbers Model

Variable	Coefficient	Std. Error	t-Statistic	Prob.
Summer	8.333	0.63	13.20	0.000
Autumn	8.261	0.63	13.03	0.000
Winter	8.408	0.64	13.16	0.000
Spring	8.274	0.64	12.95	0.000
Linear trend	-0.045	0.01	-3.71	0.001
Non-linear trend	0.001	0.00	2.90	0.006
Lagged interest rates	-1.076	0.25	-4.27	0.000
DCS	-0.297	0.12	-2.52	0.016
R <sup>2</sup>	75%			
Adjusted R <sup>2</sup>	71%			
Serial correlation test	passed			

The results embodied in the table above closely mirror those for consent values (as one might expect). Namely, consent numbers follow both linear and non-linear trends, and exhibit seasonal patterns. Furthermore, consent numbers are negatively affected by interest rate increases. Specifically, a 10% increase in interest rates leads to a 10.8% reduction in consent numbers. Finally, the results suggest that, holding everything else constant, the introduction of DCs led to a 3% reduction in consent numbers.<sup>4</sup> Once again, however, this is of borderline significance.

The estimated consent numbers generated by this model are compared with actual numbers in the chart below. In general, the model fits quite well, but it is poor at picking spikes and troughs.

**Figure 19:** Estimated Consent Numbers from Detailed model of House Consent Numbers

<sup>4</sup> Numerically-inclined readers may have noticed that consent numbers react more strongly to interest rates and DCs than do consent values. This, we suspect, is because the latter is insulated (at least to some extent) by ongoing increases in dwelling sizes, and values per square metre.

#### *Models for Other Councils*

Fuelled by the (somewhat modest) success of our Waitakere consents analysis, and wishing to know whether such effects have been felt elsewhere, we extended the analysis to Rodney, Manukau, Auckland and North Shore. Specifically, we constructed models of consent numbers for each of these other Councils to test whether the introduction of DCs had any impacts.<sup>5</sup>

The results suggest that DCs have had even smaller (and even less significant) impacts on consents in neighbouring areas.

#### **4.3.2. Models – Apartments**

Despite extensive testing of numerous functional forms and sets of variables, we were unable to derive satisfactory models of apartment consents upon which to test for structural breaks. This is due largely to the inherent variation in these series. The inability to model this data was not considered too serious, however, as apartment consents accounted for only 18% of the value of consents issued in Waitakere between 1996 and 2006.

#### **4.4. Conclusions**

Our econometric analysis of stand-alone dwelling consents for Waitakere City suggest that there may have been some small but statistically-borderline impacts of DCs on consent numbers (which then flow through to consent values). However, alternative functional forms would likely have generated quite different results, so one must be careful about interpretation. In addition, we were unable to find any evidence of DC-related consent effects in neighbouring jurisdictions.

If anything, interest rates appear to be the greatest driver of residential consents, with a 10% increase reducing the number of consents by nearly 11%.

Finally, it is possible that the 'DC effects' picked up by our analysis actually reflect changes in related factors – such as consent processing times – which may have increased as a result of DCs.

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<sup>5</sup> We are acutely aware that Rodney is yet to introduce DCs, and are using the adoption of Plan Change 62 (in April 2005) as a proxy.

## 5. Impacts on Housing Affordability

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### 5.1. Objective

The objective of this section is to examine whether DCs have had any noticeable impacts on housing affordability. We consider effects on both house prices and rents, with the latter disaggregated by rent quartile.

### 5.2. Approach & Data – House Prices

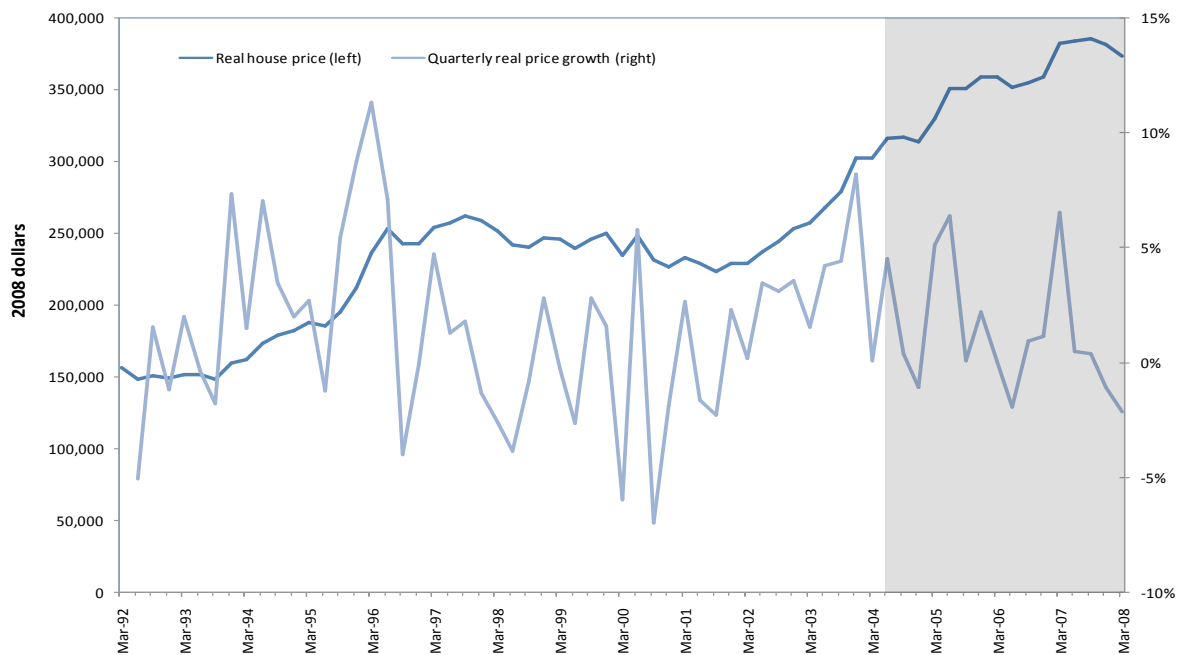
To assess the impact of DCs on house prices, we obtained monthly house price sales data from the Real Estate Institute of New Zealand from January 1992 to March 2008. This included the number of houses sold by all real estate agents and the median price of these sales. Total figures for Waitakere city were not provided, but sales were broken down into areas labeled ‘Waitakeres’, ‘Henderson’, ‘Glen Eden’ and ‘Titirangi’.

We calculated an overall average sale price for Waitakere city by taking a weighted average of the median prices in these areas, with the weights proportional to the number of sales. We also averaged prices over each quarter, weighted by the number of sales in each month. We then converted these quarterly average prices for Waitakere city to real values using the consumer price index. Figure 20 shows the results of these calculations.

Before moving on, we consider it important to explain our use of CPI to deflate house prices (as well as rents). In essence, the reason that we deflate by CPI (rather than use nominal values or some other price deflator – such as the construction price index) is because we are interested in how the price of housing is moving relative to the prices of other goods and services. *i.e.* we wish to know whether housing is becoming more or less expensive than other commodities over time. Deflating by the CPI allows us to do this, because it places house price inflation in context of general inflation. The use of nominal values or other deflationary methods would obscure such insights.

### 5.3. Results – House Prices

In line with property markets in general in New Zealand, real house prices experienced strong growth between 2002 and 2007, but growth has been weak over the past year. The shaded area shows the period for which DCs applied in Waitakere.

**Figure 20** Average real house prices and quarterly growth rates for Waitakere (2008 dollars).

We tested a number of econometric models to examine whether DCs have had an effect on house prices in Waitakere. Since many people have a choice of whether to rent or buy a house, we would expect that house prices and rents in a given area would be determined jointly by underlying market conditions. Therefore, we investigated models using systems of equations where both house prices and rents are determined simultaneously (using the rental data described below). However, we were unable to estimate relationships that were statistically robust to enable us to follow this approach. We therefore present separate analysis for house price and rents.

For technical econometric reasons, we also worked with the quarterly growth rate of real house prices (the red line in Figure 20) rather than the quarterly real price level.<sup>6</sup> A summary of our regression models is provided in the appendix to this report.

Overall, our results indicate that quarterly house price growth rates are difficult to explain using predictable factors or macroeconomic variables. Nevertheless, controlling for these variables where possible, we found no statistically-significant effect of DCs on real house price growth rates.

<sup>6</sup> In technical terms, the real house price series (the blue line in Figure 20) is non-stationary. Although the line in the figure appears to follow a general upwards trend, statistical tests revealed that this is not a regular or predictable trend but rather a series of seemingly random price changes added together. Since other explanatory variables for house prices such as real GDP and interest rates have similar non-stationary characteristics, for technical reasons there is a possibility that seemingly good regressions estimated with these variables will in fact be spurious results. Using econometric tests, we were unable to fit regressions between the level of real house prices and other variables that were not spurious. Using the growth rate of real house prices rather than the level avoids these problems, because statistical tests showed that the growth rate is stationary – it fluctuates around a constant average value over time.

## 5.4. Results - House Rents

Next, we obtained bond-lodgment data kept by the Department of Building and Housing. These show the median, lower quartile and upper quartile rents for new tenancy agreements signed in Waitakere in each quarter between March 1991 and June 2007.<sup>7</sup> We converted these to real figures to remove the effects of general price inflation. The results of our calculations are shown in Figure 21 (with the shaded area representing the period when DCs applied in Waitakere).

**Figure 21** Real rents for new tenancy agreements in Waitakere.

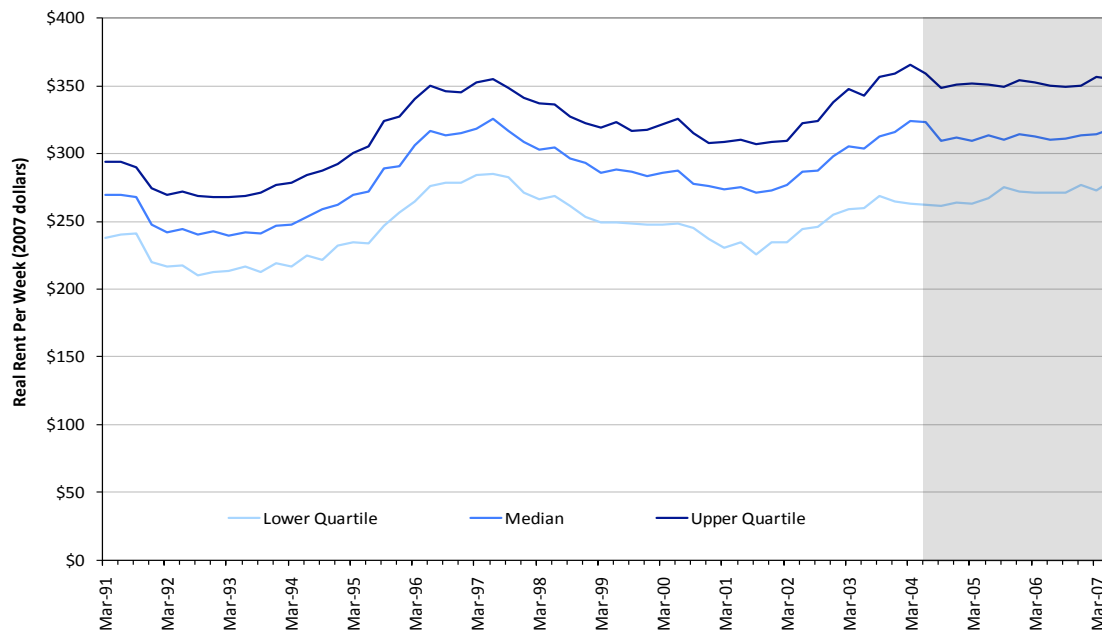


Figure 22 shows the quarterly growth rates associated with each of the real rent measures presented in the preceding figure.

For technical reasons, we have used these growth rates rather than the levels of rents in our analysis.<sup>8</sup> The shaded region, again, shows when DCs applied in Waitakere.

<sup>7</sup> We are grateful to Andrew Aitken of Motu for his assistance with obtaining this data.

<sup>8</sup> Again technical stationarity issues made it preferable to work with growth rates rather than the levels of rents.

Figure 22 Quarterly growth rates of real rents in Waitakere.

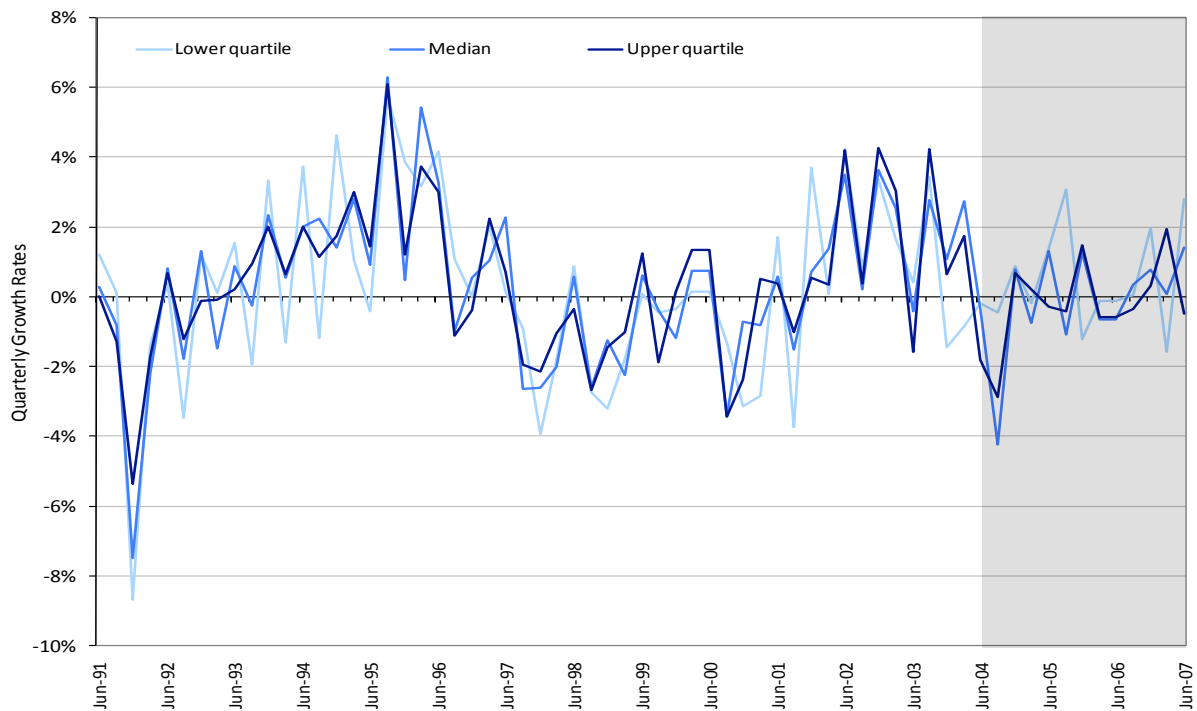


Figure 22 shows that while the lower quartile, median and upper quartile rent growth rates follow broadly the same pattern over time, there are some obvious differences in the three series. Therefore we performed analyses on each of the three growth rates separately. This also allows us to examine separate effects of DCs on low, medium and high measures of rents in Waitakere.

Once again, we relegate a discussion of our regression models to the appendix for more technically-included readers. Overall, we did not find any significant effect of DCs on low, medium or high real rents in Waitakere.

## 5.5. Conclusions

Our analysis found no evidence of links between DCs and housing affordability (when measured either as house prices or rental values). This is consistent with the findings of our earlier report, which stated that DC-related price effects would quickly be overshadowed by the forces of market demand and supply. In essence, the changes in relative prices caused by DCs are too small to make a difference.

## 6. Effects on Business Investment

### 6.1. Objective

The objective of this section is to examine whether the introduction of DCs affected the rate of business investment in Waitakere City, particularly in the construction industry.

### 6.2. Approach and Data

Business investment is a broad term covering a wide range of activities, such as:

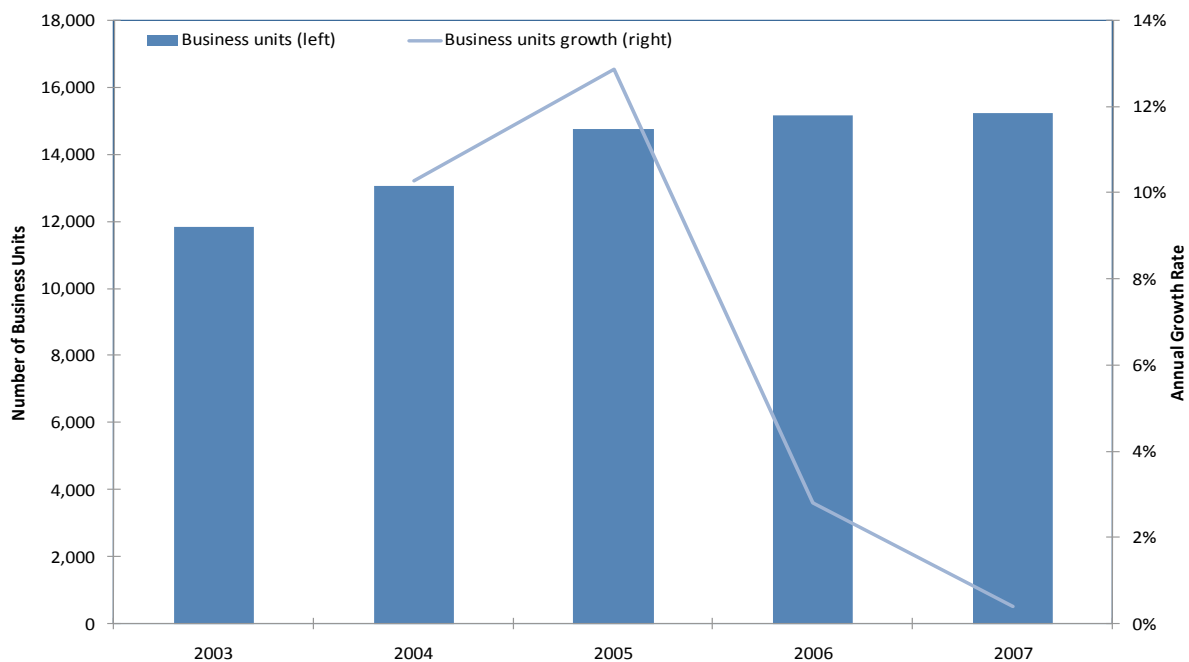
- the opening of new businesses,
- investment in capital items, such as machinery, premises and intellectual property, and
- other types of expansion by existing businesses in Waitakere.

At the outset, we wished to analyse all such forms of investment. Unfortunately, however, reliable figures on direct business investment (*e.g.* the purchase of machinery and other large capital items) were difficult to obtain at the sub-national level. Our analysis therefore concentrates on changes in the number of registered business units, as well as impacts on the level of non-residential building consents. Data for these was drawn from (i) recent *BERL Economic Performance Reports* for Waitakere City, and (ii) building consent data from Stats NZ.

### 6.3. Results – Number of Registered Businesses

Figure 23 presents annual data on the total number of business units registered in Waitakere (from recent BERL reports). Regrettably, there are too few data points to support formal statistical tests, but the graph does indicate a slowdown from 2006 onwards. Of course, it is impossible to attribute this to DCs – it could reflect changes in a number of economic variables (such as higher interest rates and/or lower overall economic growth).

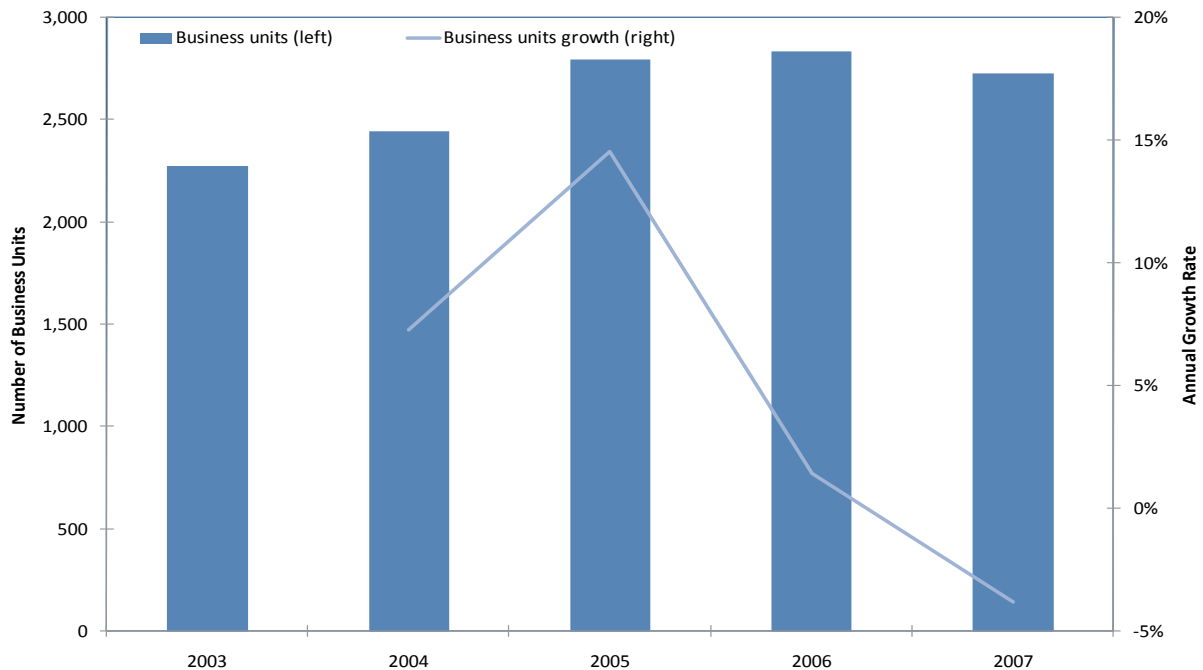
Figure 23: Business units in Waitakere (all industries).



Source: BERL Waitakere City economic performance reports.

Figure 24 presents the annual number of business units in Waitakere for the building industry alone (as defined by BERL). Again there is a slowdown in business unit growth evident from 2005 (and negative growth in 2007), but data scarcity precludes us forging any possible links with the introduction of DCs.

**Figure 24** Building industry business units in Waitakere.



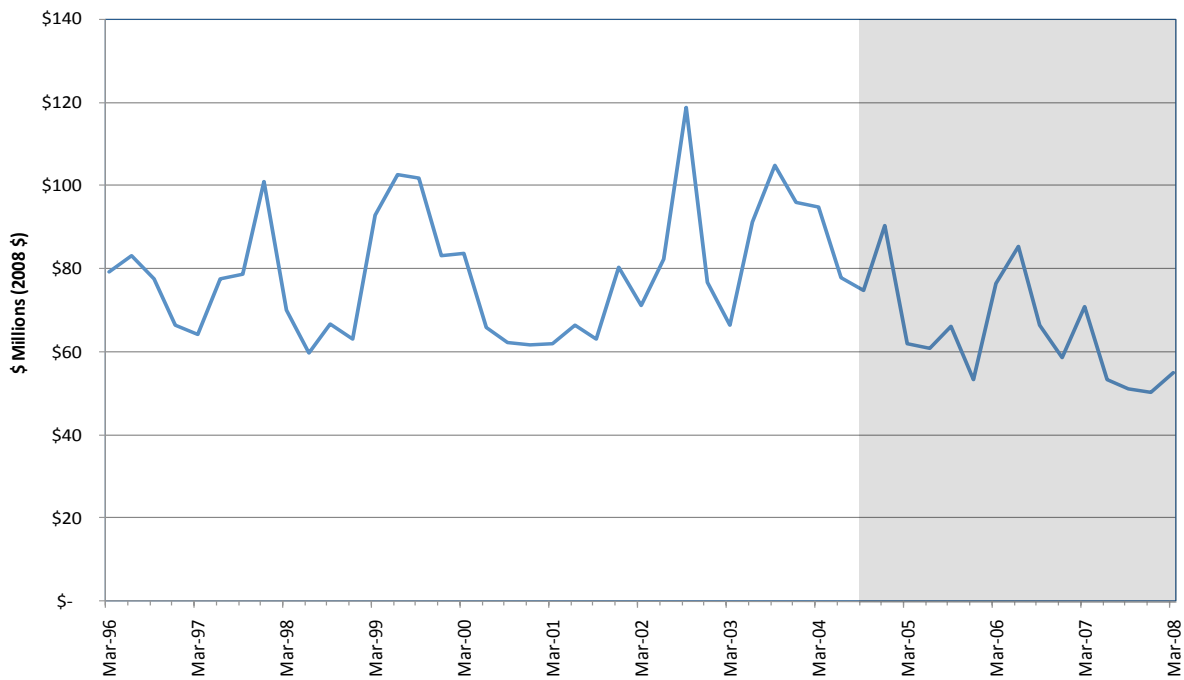
Source: BERL Waitakere City economic performance reports.

#### 6.4. Results – Non-Residential Consents

The use of non-residential building consents data permits us to undertake more sophisticated testing of any relationships between DCs and business investment in Waitakere. To this end, Figure 25 shows the total quarterly real value of non-residential consents in Waitakere since 1996. Once again, the shaded area denotes the period in which DCs applied in Waitakere.

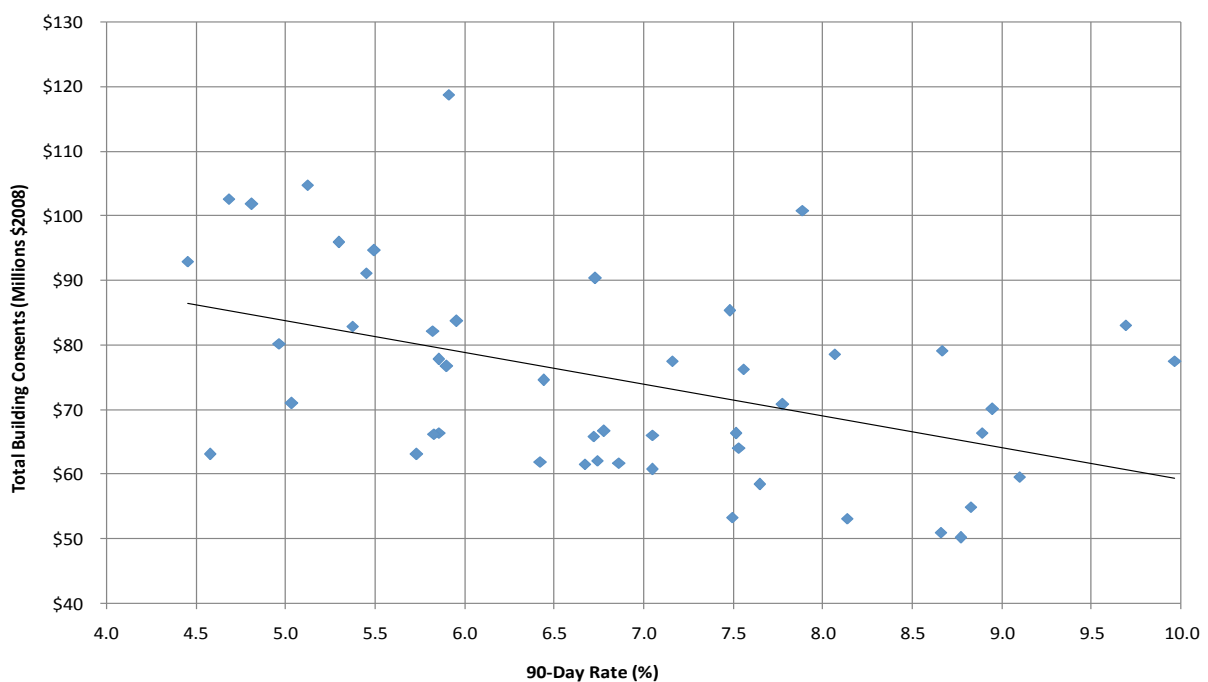
Figure 25 does appear to show a downward trend in the real value of non-residential building consents in the period post-introduction of DCs. However, before assuming any direct links to the introduction of DCs, we must first control for changes in a raft of more general economic conditions, which also have bearings on business investment. Our approach to this analysis is set out in the appendix to this report.

**Figure 25:** Real total value of non-residential building consents issued in Waitakere.



In summary, once macroeconomic conditions are accounted for, there is no evidence of any statistical relationship between the introduction of DCs and the value of non-residential building consents. Other factors, such as interest rates, have a much greater bearing. This can be seen in the chart below, which plots the value of non-residential consents against 90-day interest rates.

**Figure 26** Real value of quarterly non-residential building consents in Waitakere versus the quarterly average 90-day interest rate.



## 6.5. Conclusion

Although there have been slow downs in the rate of business growth in Waitakere since the introduction of DCs, there is no evidence to suggest any links between the two. In fact, according to recent BERL reports, Waitakere had the 14<sup>th</sup> fastest rate of business unit growth across all Councils during the first year that DCs were applied (*i.e.* to June 2005).

In reality, DCs are only one of many factors that determine the rate and location of business growth and, even then, they are not a major determinant.

Our analysis of non-residential building consent data reinforced these findings. The market for (residential and non-residential) construction appears to be driven primarily by long-term trends and the prevailing rate of interest. DCs, once again, seem largely immaterial.

# 7. Effects on Employment

## 7.1. Objective

The objective of this section is to test whether DCs had any impact on employment in Waitakere, particularly in the construction industry.

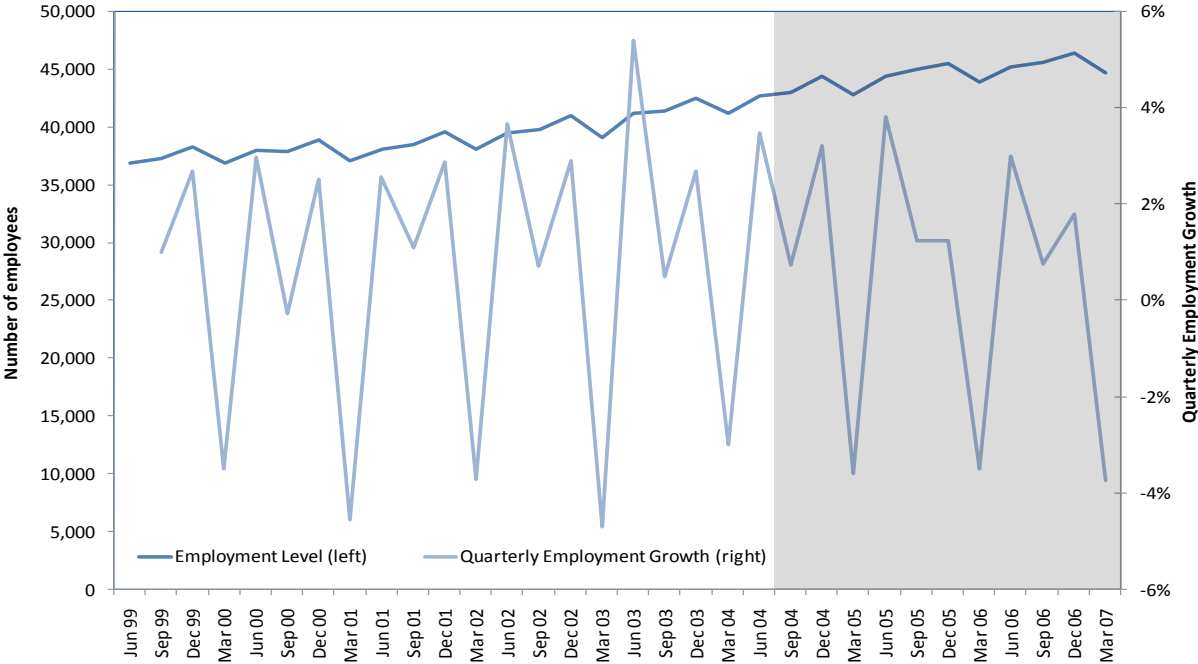
## 7.2. Approach and Data

Our analysis uses a relatively new dataset from Statistics New Zealand called the 'Linked Employer-Employee Dataset', or LEED for short. This links together employer and employee records from range of sources to provide better insights to the working patterns of New Zealanders. The data spans a range of indicators, including the number of jobs created and destroyed, total jobs filled, worker accessions and separations, median wages, and so on. The first data were released in 2006, and backdated to 1999.

## 7.3. Results – Total Employment

Figure 27 shows the quarterly number of employed people in Waitakere from June 1999 to March 2007 (across all industries) along with corresponding percentage changes. The figure shows a clear seasonal pattern to employment, which we have factored into our analysis. The shaded area, once again, represents the period that DCs applied in Waitakere.

Figure 27 Total employment and employment growth in Waitakere.



In terms of econometrics, we first attempted to assess whether there was any effect on *relative* employment growth rates in Waitakere versus neighbouring councils (by looking at periods where DCs applied only in Waitakere). This allowed us to control for general macroeconomic factors that would have affected employment in all areas (and therefore help expose any true DC-related effects). However, since DCs were introduced in North Shore at the same time (and

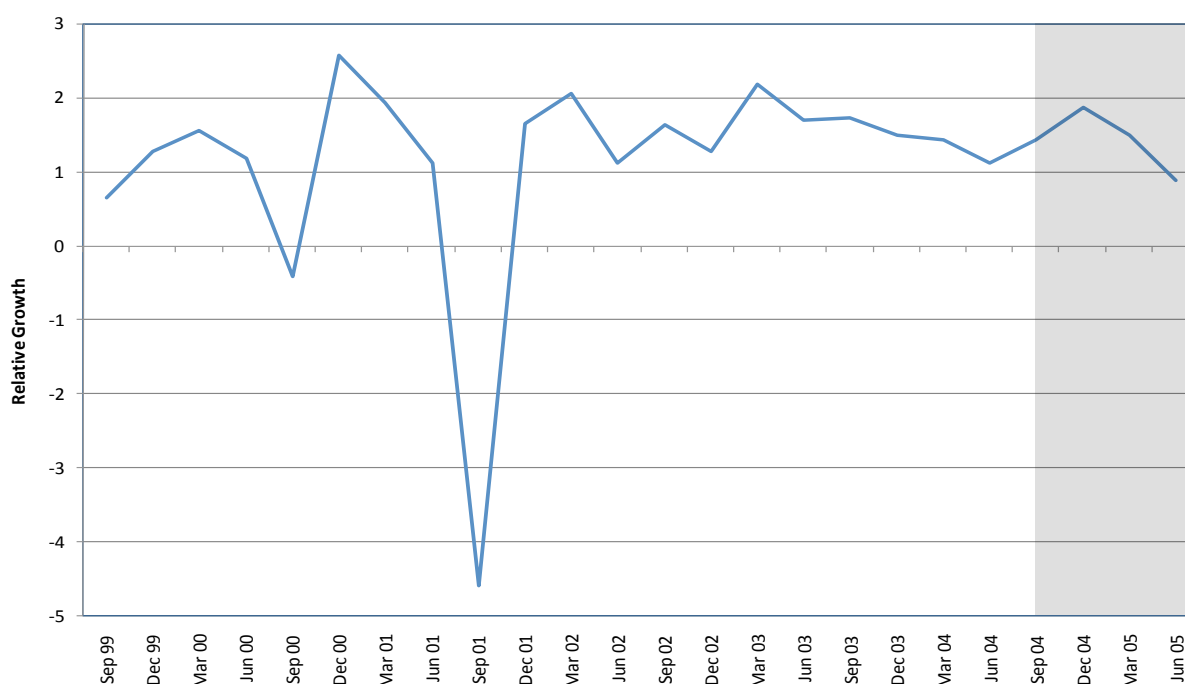
shortly after in Manukau, Rodney and Auckland City), there were very few observations over which such an analysis could be performed.

Overall, the best candidate for comparison is Auckland City - it gives us four quarters where DCs applied in Waitakere but not in the control group (*i.e.* Auckland City).

Figure 28 shows the quarterly employment growth rate for Waitakere divided by that for Auckland City (up to the time where DCs were introduced in Auckland City). The small shaded represents the period that DCs applied in Waitakere, but not Auckland City.

From the graph, there appears to be no clear effect of the introduction of DCs on relative employment growth in Waitakere versus Auckland City. That is to say, there is no obvious change in trends in the shaded part of the chart. This is confirmed by a statistical test. The average ratio of employment growth in Waitakere to Auckland City prior to the introduction of DCs is 1.14, and after the introduction of DCs in Waitakere but prior to their introduction in Auckland city is 1.42, but this difference is not statistically significant ( $p$ -value = 0.48).<sup>9</sup>

**Figure 28:** Relative quarterly employment growth in Waitakere versus Auckland City.



Since there are relatively few time periods in which employment growth under DCs in Waitakere can be compared with employment growth absent DCs in other neighbouring areas, we also examined the effects of the introduction of DCs on employment growth in Waitakere alone. We fitted regression models to estimate whether there was a change in the average level of employment growth after the introduction of DCs compared to before, taking account of the seasonal pattern of employment and the general macroeconomic environment. The results of our efforts are, again, presented in the appendix.

<sup>9</sup> These results are basically unaffected by removing the large negative value in the September 2001 quarter.

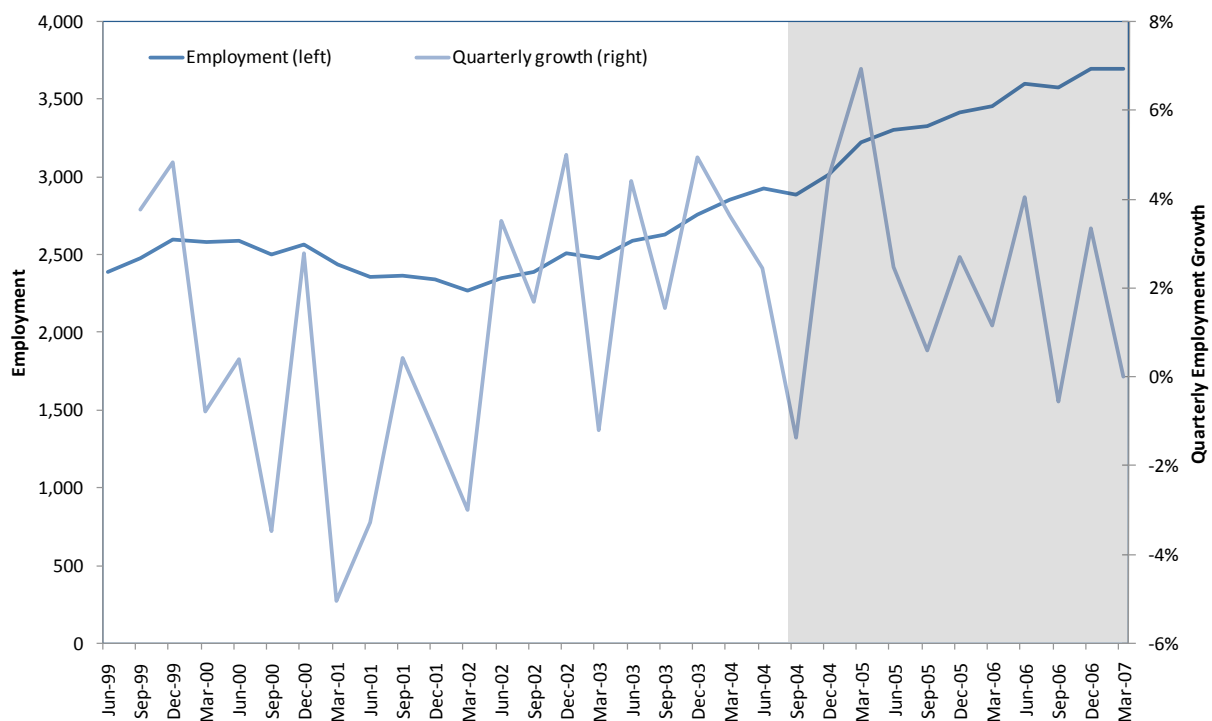
## 7.4. Results – Construction Employment

If the introduction of DCs was likely to affect employment in any given industry, it is construction. We therefore set about testing for any effects of DCs on employment growth on Waitakere’s construction industry.

Figure 29 plots quarterly construction employment in Waitakere from July 1999 to March 2007, with the shaded area being the period in which DCs applied.

From Figure 29, we can see that there has been strong positive growth in construction industry employment in Waitakere from 2002 onwards, and there is no clear sign from this basic data that DCs have had any significant effects. This was formally tested using a range of econometric techniques, as described in the appendix.

**Figure 29:** Employment in the construction industry in Waitakere.



In summary, the analysis that we have conducted shows that there is no evidence of a significant effect of DCs on employment in the construction industry in Waitakere, nor total employment in Waitakere.

## 7.5. Conclusion

Our analysis found no evidence of a relationship between DCs and the rate of employment growth, even for the construction industry. By contrast, according to recent BERL reports, construction was one of the ten fastest growing industries in Waitakere during the year to June 2005.

Overall, employment seems to be driven by a range of other, wider macroeconomic factors. The effects of DCs (if any) are difficult to discern.

## 8. Environmental Impacts

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### 8.1. Objective

The objective of this section is to consider whether – or to what extent – DCs have had any environmental impacts in Waitakere City. Our focus here is on the degree to which spatial variation in charges support Council’s growth aspirations.

### 8.2. Approach & Data

Using data from the 2004 and 2006 DC policies, we examine the level of charges in the two main catchment areas – NORSGA and the rest of the city. Then, we discuss whether these can be justified on the basis of cost. Finally, we consider whether the relative sizes of charges supports Council’s general policy of containing urban sprawl. First, however, we provide a general discussion of the use of catchments, and assess the process used by Waitakere City to derive its set of catchments.

### 8.3. Discussion of Catchments

In addition to levying charges on a city- or district-wide basis, the Local Government Act 2002 (LGA02) also allows Council’s to set development contributions at the sub-district level. As a result, many Councils have adopted ‘catchments’, where the cost of a given activity or service varies geographically. Waitakere city currently distinguishes two major catchments – NORSGA and the rest of the city. It also levies a number of charges on a uniform city-wide basis.

So, what are the advantages and disadvantages of using city-wide versus catchment-level charges for development contributions?

The use of city-wide catchment has some definite advantages. First, it overcomes the need to generate sub-city forecasts of capital expenditures and growth. Both can be difficult to estimate, particularly as catchment size shrinks. This inherent difficulty may expose Council to major financial risk, especially if growth projections are overstated and/or capital costs are understated. Moreover, generating growth and expenditure forecasts at fine levels of granularity can be time consuming, and greatly increase the resource required to implement a policy.

Second, the use of city-wide catchments provides greater certainty over the level of charges facing developers. Indeed, while the boundaries of localised catchments (and therefore the level of charges faced by developments within them) can often be inferred by their names, the precise geographic limits of each catchment are often vague. Furthermore, different sets of catchments are often used for different services. This can make it difficult to identify the particular suite of charges facing developments in any given area. The use of a city-wide catchment in all cases circumvents these issues, as well as providing administrative simplicity.

Third, in geographically-compact cities and districts, some infrastructure networks (such as water and roading) often operate as a single entity. In such cases, city-wide catchments are the only logical choice.

Finally, city-wide catchments increase the flexibility of capital budgeting and allow councils to exploit economies of scale and scope. This stems from §204 of the LGA02, which states:

*“A development contribution – (a) must be used for, or towards, the capital expenditure of the reserve, network infrastructure, or community infrastructure for which the contribution was required....”*

Amongst other things, this means that contributions collected within a certain catchment must be spent on growth-related capital expenditures only within that catchment. Consequently, if development in a certain catchment falls short of expectations, council may have insufficient funds to undertake planned capital expenditures in that area. Furthermore, Council will be unable to borrow from contributions received from developers in other areas to fund the shortfall. The use of multiple catchments can therefore limit the flexibility of capital budgeting.

In addition, because funds must be spent only in the area from which they are collected, the use of multiple catchments limits councils’ ability to undertake large, city-wide projects. This, in turn, may limit their ability to exploit economies of scale and scope.

Clearly, then, citywide catchments have a number of advantages. But what are the advantages of using sub-city catchments? The short answer is (i) economic efficiency and (ii) equity.

By using multiple catchments and allowing contributions to vary from one catchment to the next, Councils can provide clear signals to the market about the resource implications of choosing to develop in different areas. Such signals force developers to consider the true resource cost of their location decisions and help align private investment incentives with socially-optimal outcomes. This, in turn, promotes economic efficiency. Grouping all developments together in one catchment may mute these market signals at the expense of economic efficiency.

The other key reason for using multiple catchments is that they provide a higher level of equity. The use of single catchments almost inevitably results in developers in some areas (*e.g.* infill) cross-subsidising the costs of providing network infrastructure to other areas (*e.g.* greenfields). Such outcomes are generally regarded as inequitable.

As should be clear from the discussion above, there are a number of advantages and disadvantages with both citywide and sub-city catchments. But, perhaps the most important consideration is the *manner* in which Council’s arrive at their set of catchments? That is to say, it is the process – rather than the outcome – that is of greatest importance.<sup>10</sup>

So, what approach did Waitakere take to derive its catchments? To the best of our knowledge, the basic approach was as follows:

1. Spatially assign each capital works project for which a development contribution is required.
2. Derive growth projections that align with the areas to which capital works were assigned.
3. Estimate a set of catchment-based (sub-city) charges using the information produced in steps 1 and 2.
4. For each activity, analyse the implied differences in cost across catchments, and consider whether there are any grounds for aggregation. For instance, if the charges estimated for two adjacent catchments are within (say) 10% of one another, there may be reasonable grounds for grouping them into one catchment (at the benefit of administrative

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<sup>10</sup> This is certainly true of development contributions more generally. After all, they can only be challenged via judicial review on procedural grounds.

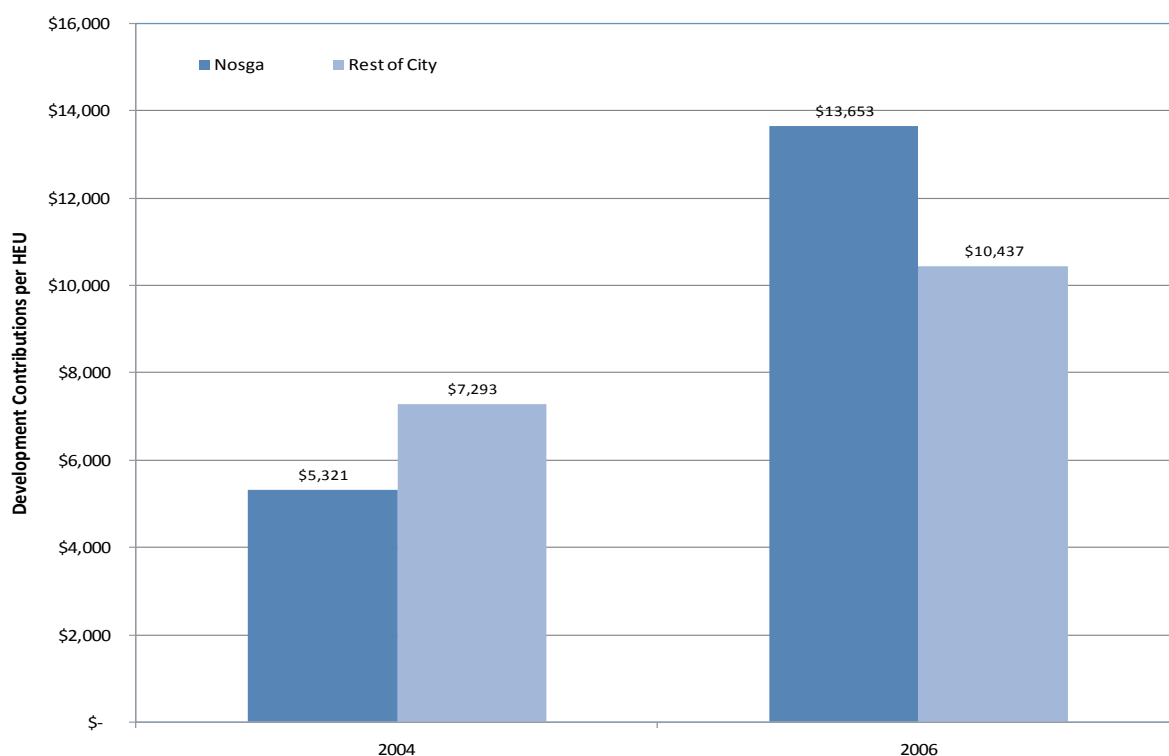
simplicity). If charges vary by a sufficiently high magnitude, there are likely to be ground to retain the initial separation.

Through this process, Waitakere arrived at a final set of catchments that appropriately balance the advantages and disadvantages discussed above. We note in passing that this is exactly the process we use with our clients, so consider it sound.

#### 8.4. Review of Charges by Catchment

Having discussed the pros and cons of citywide and sub-city catchments, we now analyse catchment-level charges in Waitakere City, both at the policy's introduction (in 2004) and also in the latest revision (2006).

Figure 30: DC Charges in Waitakere City (per HEU)



According to Figure 30, the initial charges in NORSGA were lower than the rest of the city, but this situation was reversed in 2006. In fact, between 2004 and 2006, the NORSGA charge increased 157%, while the 'rest of city' charge increased only 43%. Does this make sense? In short, yes it does.

We understand that the costs of supplying infrastructure to NORSGA are more expensive than the rest of the city, so one might expect them to be higher both now and also when the policy was first introduced. However, from a practical perspective, this is often not the case. The reason is that the infrastructure costs associated with dedicated growth areas (such as NORSGA) are often derived from structure plans, which take considerable time to finalise. Hence, in the early years of a DC policy (when structure plans are still being prepared), the LTCCP contains only a subset of the capital works required to service dedicated growth areas. Over time, as structure plans

near completion and a greater proportion of the associated capital works projects enter the LTCCP, charges tend to rise. This is exactly the pattern evident in the chart above.

### **8.5. Are there Grounds for a Cap?**

Given the rate at which the NORGA charge increased between 2004 and 2006, and recognising that Council is competing with other areas to attract growth, one might question whether there is merit in setting a cap? That is to say, should council consider introducing a maximum charge in its development contributions policy?

This a tricky policy question, and the right answer depends on a number of factors. First, one must realise that the introduction of a price ceiling (*i.e.* a cap) implies a cross-subsidy, either from developers in other areas or from ratepayers. This is generally unsound.

Second, one must think beyond the common mantra that “growth is good for the City” and consider what benefits growth really brings. For example, many cite improved employment prospects caused by increases in the number of local businesses. But, where do these additional employees come from? Are they from Waitakere City or are they from elsewhere? Moreover, are the short-term benefits of increased growth outweighed by any longer-term detriments?

The key message here is that one must think very carefully about distorting market prices using price floors or ceilings. The use of a cap to limit DCs essentially results in the pursuit of social policy at the potential expense of economic efficiency. We therefore recommend caution.

### **8.6. Conclusions**

There are a number of pros and cons with using catchment versus citywide charges. Waitakere has elected to use two broad catchment areas, one of which is earmarked for growth. Although the costs of servicing this area are higher, the initial fee was lower than the rest of the city. However, this situation was rectified during the latest policy revision, with the gap likely to increase following subsequent revisions.

Overall, we conclude that Council’s charges support the overarching objectives of (i) containing urban sprawl and (ii) ensuring that growth ‘pays its own way.’

Before closing this section, we would like note that the inclusion of a number of remissions - wherein discounts are given for actions that reduce Council’s capital costs - is another important element of the DC policy. It provides clear incentives for developers to act in an efficient, and environmentally-friendly, manner.

## 9. Effects on Rates

### 9.1. Objective

The objective of this section is to analyse the impact of development contributions on rates.

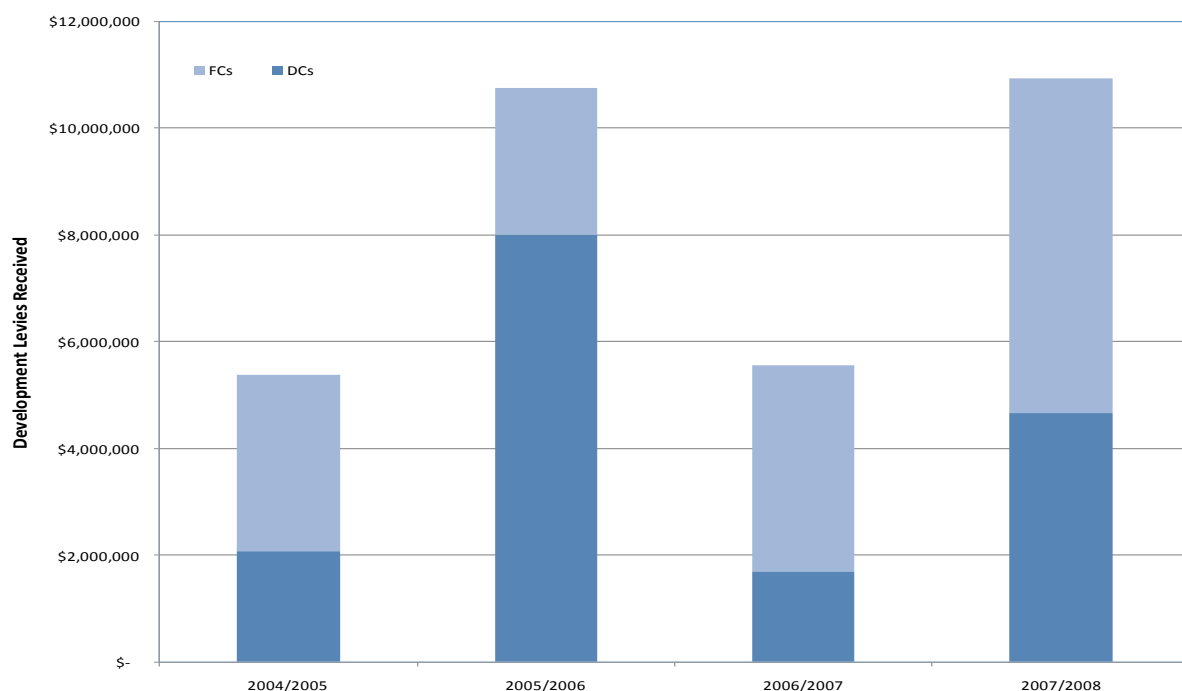
### 9.2. Approach & Data

Using data on total levies received since the introduction of DCs, and taking account of financial contributions that would have been collected in lieu, we calculate the incremental revenue raised by development contributions. Then, assuming a one-for-one reduction in rates, we translate DC revenues into rates savings per household taking account of (i) the number of households in Waitakere City, and (ii) the share of rates paid by the residential sector.

### 9.3. Results

Figure 31 shows annual development levies received since the introduction of development contributions (in July 2004). These have been disaggregated into financial contributions (FCs) and development contributions (DCs).

Figure 31: Development Levies Received since Introduction of DCs

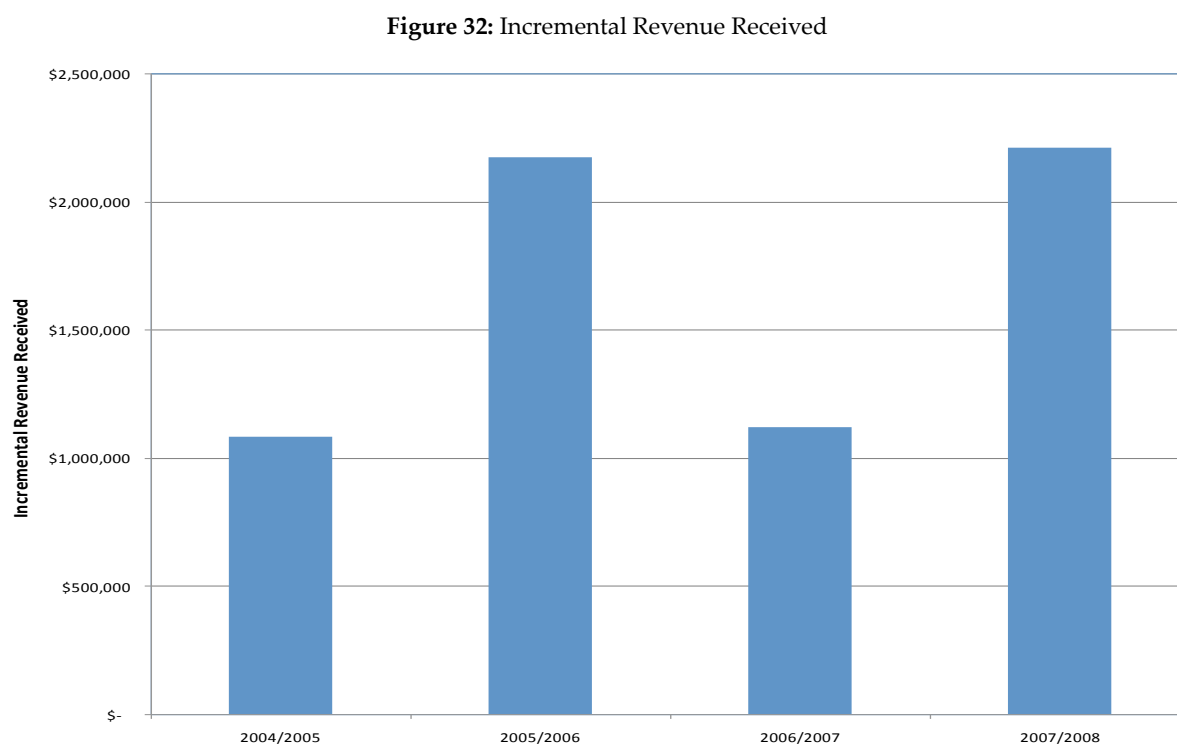


According to Figure 31, total development levies have fluctuated significantly over the last few years, both in quantum and in composition. For instance, total levies doubled between 2004/05 and 2005/06, while the share received from DCs increased from 39% to 74%.

But, how much would have been received if development contributions were not introduced? Using information from section 3.3.2, we know that pre-DC levies were about 20% lower than post-DC levies. Hence, assuming that FCs would have increased at the same rate as DCs (per lot), total levies would have been about only 20% lower absent DCs. Put slightly differently, roughly

only 20% of development levies received since 2004 are truly 'incremental.' The rest would have been collected as FCs anyway.<sup>11</sup>

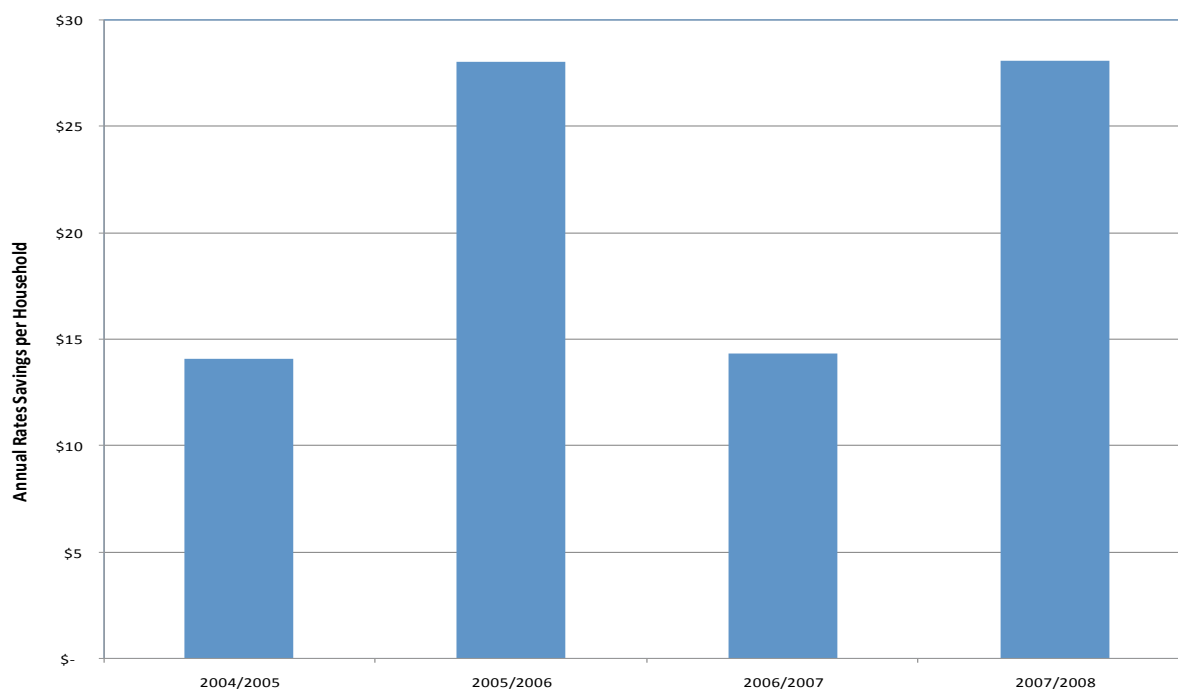
Figure 32 plots the estimated incremental revenue associated with DCs, which we interpret at direct rates reductions.



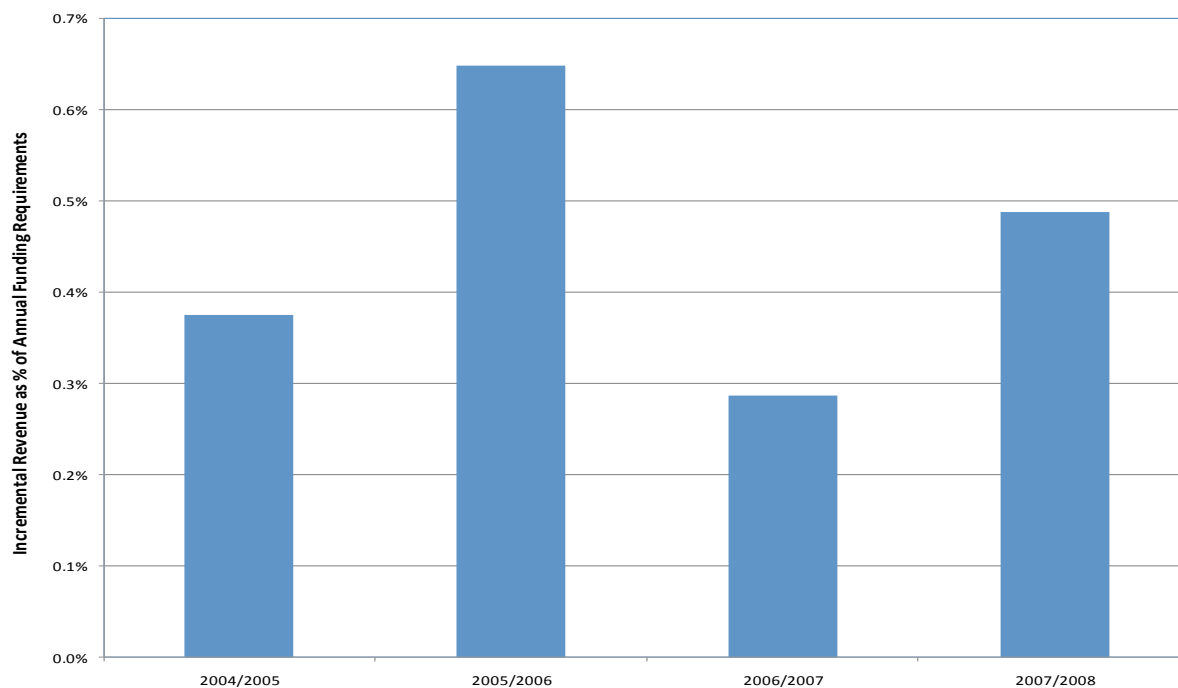
In order to translate these rates reductions into savings per household, we needed to know the share of rates paid by the residential sector, plus the number of households. Estimates of the former were gleaned from annual plans, while estimates of the latter were calculated from Council-supplied data. Overall, residential ratepayers fund about 80% of the total rate requirement, and the number of households increased from 61,200 in 2004/05 to 63,000 in 2007/08. Combining these various fragments of information, we arrived at the following estimate of DC-related rates savings per household. These do not appear to be significant.

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<sup>11</sup> This is a slight simplification. FCs are collected for two reasons: (i) to recover the costs of growth-related infrastructure, and (ii) to remedy, mitigate or avoid the adverse effects of development. The latter are wholly unrelated to DCs, and should therefore be removed from the analysis. We attempted to do this using the information available, but struck odd results. Namely, the implied level of mitigation-related FCs was negative. We therefore ignored this issue in the analysis, but note that the effect would have been minor anyway.

**Figure 33: DC-Related Rates Savings per Household**

In order to verify the low savings suggested by our calculations, we decided to also express DC-related incremental revenues as percentages of annual funding requirements (as shown in annual plans). The results – which range from 0.3% to 0.7% - are reproduced in the figure below.

**Figure 34: DC-Related Incremental Revenue as % of Annual Funding Requirements**

At best, incremental revenue raised by DCs accounts for less than 1% of the total rates requirement.

#### **9.4. Conclusions**

The introduction of development contributions has not led to significant increases in annual development levies. This is caused, mostly, by corresponding decreases in the level of financial contributions. Consequently, development contributions have not resulted in substantial rates 'savings' per household.

Furthermore, when expressed in relation to annual funding requirements, the additional revenue raised by DCs is less than 1%. Thus, despite being an important pricing mechanism, DCs are not a major source of funding. They are, however, a significant component of Council's capital budgets (where they are ultimately applied).

## 10. Summary of Developer Perceptions

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This section complements the empirical analysis by summarising developer perceptions of local authorities, and highlighting issues that developers consider of greatest importance when selecting development locations. The material presented here spans three sources:

- Developer interviews conducted during the 2004 version of this report
- A recent report by MOTU entitled *Housing Supply in the Auckland Region*, and
- Developer interviews conducted during the course of this project

### 10.1. Summary of Earlier Report

In our earlier report for WCC, we interviewed six developers to gain a greater understanding of their perceptions of developing in Waitakere compared with developing elsewhere in Auckland. The salient points were that:

- Developers were largely unaware of the forthcoming DC policy, and even less aware of the likely financial implications,
- Once provided with details on the forthcoming policy, the developers unanimously deemed it unfair. In general, they agreed with the intentions of the policy, but not the contributions generated by it.
- Some developers believed that, under the new DC policy, they would be forced to pay for some infrastructure costs that were not growth-related. *i.e.* they did not have faith in the cost allocation process.
- When asked if the DC policy might alter their decision to develop in Waitakere, most initially said “yes”, but quickly changed their minds upon learning that other councils would soon introduce similar policies. This implies that relative – not absolute - costs matter.
- Most considered land in Waitakere substitutable from their own perspectives, but less-so from a demand perspective. That is to say, consumers consider location important.
- One developer noted that land shortages – not council infrastructure levies – were the key constraint to development.
- Most developers expected to fully pass-on any additional infrastructure costs, simply on the strength of demand.
- Developers were unlikely to alter the extent of development as a result of the policy (presumably because any additional costs could be passed-on).
- Most developers considered other issues - such as consent processing times, council staff turn-over and high land costs – as the greatest impediments to development.

## 10.2. Summary of MOTU Report

In 2007, MOTU completed an extensive report entitled *Housing Supply in the Auckland Region 2000-2005*. Amongst other things, the report canvassed private and public stakeholder perceptions about a number of aspects of development. In total, 19 private-sector participants and 10 public-sector participants were interviewed face-to-face, with each interview lasting around 90 minutes. Following is a summary of responses from private-sector participants.

For ease of reading, the issues are divided into four categories:

- Land,
- Local/Central Government,
- Infrastructure, and
- Other

### 10.2.1. Land Issues

Land ownership, land availability, and the cost of land are all perceived as major development issues in Auckland. This is shown in the table below, which presents the percentage of survey respondents that identified each factor as a major constraint. For example, Table 3 shows that 84% of respondents considered the cost of land a major constraint to development, while 79% considered land availability a major constraint.

**Table 3: Importance of Land Factors**

Land	Importance
Land Availability	79%
Land Ownership	74%
Cost of Land	84%

Specific land issues cited by respondents included the existence of the Metropolitan Urban Limit (MUL), and Proposed Change 6 to the Regional Growth Strategy. The latter gives the ARC power to veto any 'urban activity' occurring outside the MUL (further reducing any scope for development in these areas).

Another issue is that vacant greenfields within the MUL tend to be closely held by a small number of owners, with supply slowly 'dribbled' into the market and prices 'artificially inflated.'

Yet another complaint was that large-scale infill development is made difficult by fragmented ownership, which requires developers to negotiate with numerous owners in order to acquire a sufficiently-large parcel.

### 10.2.2. Local/Central Government Issues

The survey also asked respondents about a number of Government-related issues. The results are tabulated below.

According to Table 4, an overwhelming 89% of developers cited consent processing times as major constraints to development, with 84% describing planning procedures in a similar fashion.

**Table 4:** Importance of Local/Central Government Factors

Government	Importance
Planning procedure	84%
Planning rules	59%
Consent preparation costs	53%
Consent processing times	89%
Community opposition	68%
Building Regulations	42%
Brownfields land conversion	21%

Delays in consent processing appear to be largely caused by piecemeal, inefficient Council procedures, which can result in lapses of up to three or four years between land purchase and the gaining of all consents. The most problematic delays relate, as one might expect, to notifiable consents.

Developers commonly believe that councils are not aware of (a) the total length of time their consent processes take, and (b) the financial and logistical implications of delay. For example, a six-month delay in consent processing on a \$12 million dollar development with a 10% weighted-average cost of capital incurs borrowing (interest) costs of \$600,000.

Community opposition, which was considered a major constraint by over two-thirds of respondents, has allegedly been exacerbated by poorly-executed past developments, which make locals more sceptical of – and therefore inclined to object – new development proposals.

The use of consultants to process applications on behalf of Council also came under criticism. They were perceived to face perverse incentives, because the longer they took to process consent applications, the more they got paid.

Consent preparation costs were generally considered immaterial compared to time-related consent processing costs, but were of greater concern to smaller developers than larger ones.

Within Auckland, developers considered Manukau the most helpful Council, and North Shore the least helpful. However, overall, developers found Auckland councils more problematic to deal with than Councils in smaller towns and cities.

### 10.2.3. Infrastructure Issues

The survey also gauged opinions about a range of infrastructure-related issues. The results are summarised in Table 5.

**Table 5:** Importance of Infrastructure Factors

Infrastructure	Importance
Availability of infrastructure	53%
Drainage requirements	42%
Infrastructure contributions	79%
Development contributions	84%
Site access factors	26%

Over half of respondents considered infrastructure availability to be a major constraint, although responses tended to be location-specific. In some areas, Councils collaborated with developers to deliver timely infrastructure solutions, while in other areas the provision of infrastructure was much less streamlined.

The approach to charging for infrastructure was cited as a much greater cause for concern, however, with 84% of respondents identifying them as major constraints. There appear to be three main issues here. First, the practices for determining contributions vary greatly across TLAs, providing little certainty to developers. Second, on-site mitigation measures (which reduce the need for Council infrastructure) are seldom rewarded with appropriate contribution abatements, especially in the case of drainage.<sup>12</sup> Third, developers perceive Council's to be unwilling to fund capital works from debt.<sup>13</sup>

#### 10.2.4. Other Issues

Finally, the survey quizzed respondents about a number of other general issues, such as the availability of resources, the degree of competition, and profit margins. Overall, labour and materials shortages – along with diminished margins – appear to be of greatest concern.

**Table 6:** Importance of Other Factors

Other Factors	Importance
Lack of innovation	37%
Finance availability	0%
Cost of building materials	58%
Market demand for type	32%
Increasing competition	16%
Low profit margins	63%
Availability of labour	58%
Availability of materials	11%

### 10.3. Summary of Recent Developer Interviews

Based on the contents of the MOTU report (discussed above), we designed a simple survey to better understand current attitudes to developing in Waitakere City (and thus dealing with Waitakere City Council). In total, there were eight respondents. We are unable to reveal their identities, however, as confidentiality promises were made to elicit more open and honest responses.

The survey comprised a quantitative section, and a qualitative section. The former asked respondents to rank various aspects of developing in Waitakere on a scale of 1 to 10, where 1 meant that the factor worked badly against developing in Waitakere, and 10 meant that it worked in its favour. The qualitative section allowed respondents to expand on these answers and provide more detail where required. A copy of the survey form is provided in the appendix, and the results are summarised below.

<sup>12</sup> We note that, in the case of Waitakere City, this is likely to be less of a problem due to remissions policies.

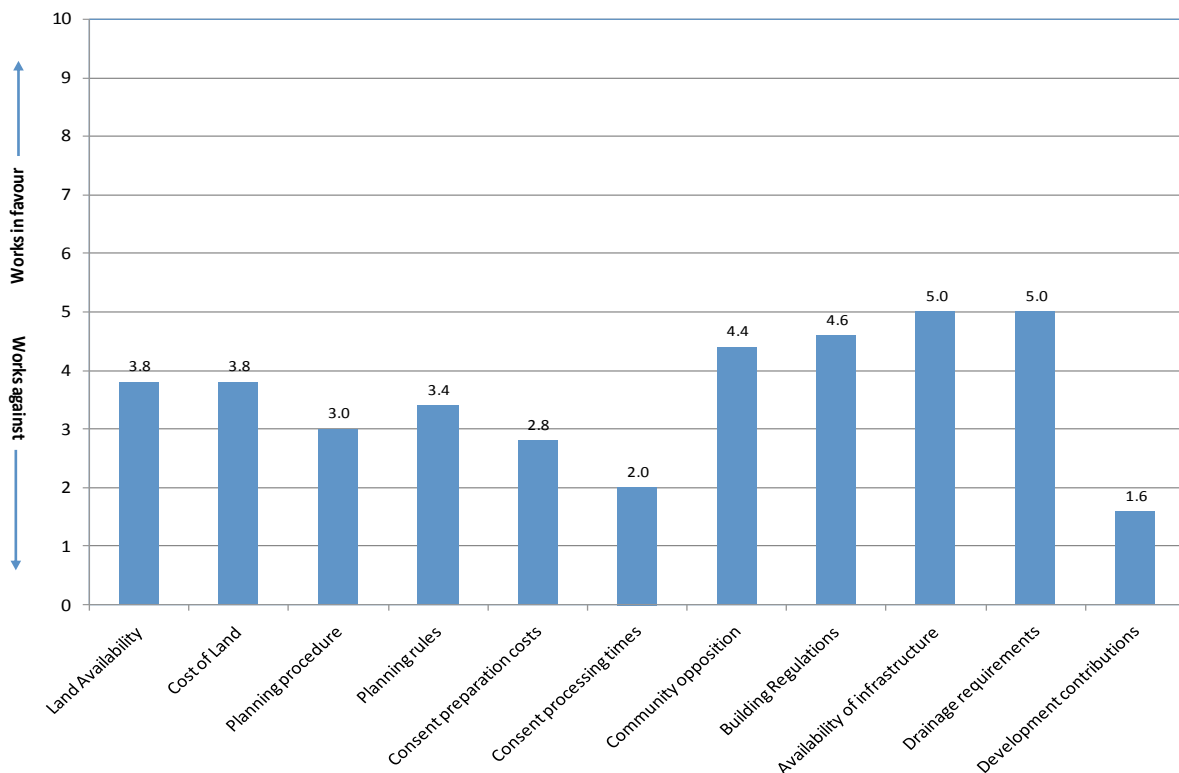
<sup>13</sup> To elaborate, some respondents suggested that Council's reduce development contributions and instead recoup the money from affected properties over time using targeted rates. This would reduce the initial cost of purchase, and possibly improve housing affordability.

Before reading the results of our survey, we consider it important to place them in context. Survey respondents were all participants in the development process – such as builders and developers – and therefore were biased. Nevertheless, their feedback provides some important insights.

### 10.3.1. Responses to Quantitative Section

Figure 35 summarises responses to the quantitative section, which asked respondents to rank a number of factors on a scale of 1 to 10.

**Figure 35:** Factors that work against/in-favour of developing in Waitakere (1=bad, 10=good)



According to Figure 35, consent processing times, development contributions, and consent preparation costs are the factors that most negatively impact development prospects in Waitakere.<sup>14</sup> Similar concerns were also expressed about planning procedures and planning rules, but to a lesser extent.

The most favourable aspects of developing in Waitakere are the availability of infrastructure and Council’s stated drainage requirements, although neither exceeded a score of five out of ten.

<sup>14</sup> It is interesting to note that, despite scoring worst on the quantitative survey, development contributions received little attention in the qualitative section of our survey. It seems that, although they are not well-liked, development contributions are perceived as inevitable. In general, developers acknowledge the need to contribute to infrastructure, but tend to disagree with the level of contributions sought.

Overall, there appear to be a number of factors that work against developing in Waitakere, at least from a private-sector perspective. The following section provides greater details on these issues.

### **10.3.2. What is WCC good at (from a development perspective)?**

This question drew varied responses, ranging from “nothing” to “some staff are really good staff, and the website contains lots of useful information.” Overall, however, there were very few positive comments.

### **10.3.3. What is WCC particularly bad at?**

This question drew much more fervent responses, with the key issues summarised below.

- Consent processing times are woefully slow, resulting in dramatic and costly delays. Moreover, there is an overwhelming feeling that Council does not understand the grave financial and logistical implications of delays.
- Communication with staff is made difficult by several factors. First, there is a number of good staff but they tend to be turned over quickly, resulting in losses of continuity and even greater time delays. Second, there are often multiple points of contact, making it difficult to know who to contact at any given point in time. Third, Council officers are very poor at returning calls. Fourth, there appears to be a lack of co-ordination between departments, resulting in confusing and mixed messages. Fifth, many staff are foreign-speaking, and do not communicate clearly.
- Some respondents also noted that the rules of development appear to change frequently, seemingly without warning.
- One respondent commented that concept plans take far too long, adding to delays. In addition, Council seems insistent on commissioning numerous (seemingly-trivial) background reports, which often also require peer-review.
- One respondent stated that the use of consultants to process applications was not efficient, because they had neither the mandate nor the incentive to find solutions.
- Finally, a few respondents claimed that consents conditions are far too prescriptive. They felt that Council should focus more on outcomes, not processes.

### **10.3.4. Any other Comments/Suggestions?**

Finally, the survey allowed developers to make any general comments or suggestions to improve Waitakere’s development processes. The general feelings were that:

- Communications need to be greatly-improved,
- Email is the preferred medium for written correspondence, and
- Council’s overall attitude to development needs to improve, and quickly.



## Appendix 2 - Regression Results

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This section summarises the various regression models that we estimated during the course of this project, and explains the basis on which our final models were selected. Please note that the material presented here is fairly technical, and can readily be skipped by most readers.

### House Price Models

Table 7 presents results of various regression models that assess the impact of DCs on real house price growth, accounting for various other factors. Model 1 simply controls for seasonal factors and tests whether the average quarterly growth rate after DCs were introduced is significantly different to that before. The very poor performance of this model (it only explains 1% of the variation in growth rates over time) indicates that quarterly growth of house prices does not follow a regular seasonal pattern. Model 2 is the same but omits the insignificant quarterly factors. This model is equivalent to simply testing whether the average quarterly growth rate after DCs is significantly different from that before. The coefficient on the DC dummy variable is highly statistically insignificant, indicating there is no significant difference in the simple averages.

Models 3 and 4 control for time trends in the quarterly growth rate and again perform poorly, indicating there is no predictable increase or decrease in quarterly house price growth over time. Somewhat better performance is achieved by models 5 and 6 which include quarterly real GDP growth (for New Zealand) and interest rates (represented by the quarterly average 90-day interest rate). In general it could be expected to take time for changes in these variables to flow through into house prices, so we tested various combinations of lags of these variables to determine the best fitting model. As shown in Table 7, this turned out to be real GDP growth in the previous quarter and four quarters ago, and interest rates during the previous two quarters. All of these macroeconomic factors are highly statistically significant and greatly improve the ability of the regression model to explain variation in quarterly house price growth. However, controlling for these factors leaves the DC dummy variable statistically insignificant.<sup>15</sup>

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<sup>15</sup> In addition to these factors, we also tested controlling for the number of residential building consents for new buildings issued each quarter in Waitakere. This data series is shorter than the other series, going back to March 1996. Residential consents and lags of these were found to be statistically insignificant in explaining house prices, and had no effect on the significance of the DC dummy variable.

**Table 7** Regression results for quarterly real house price growth in Waitakere (standard errors in brackets).

Variable	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
Constant	0.022** (0.010)	0.015** (0.005)	0.015 (0.012)	0.013 (0.012)	-0.005 (0.008)	-0.026 (0.024)
Quarter 1 Dummy	-0.004 (0.013)					
Quarter 2 Dummy	-0.006 (0.013)					
Quarter 3 Dummy	-0.016 (0.013)					
Time trend			0.000 (0.001)	0.000 (0.001)		
DC dummy	-0.004 (0.011)	-0.004 (0.011)	-0.004 (0.016)	0.100 (0.139)	-0.005 (0.010)	0.004 (0.010)
DC dummy × time trend				-0.002 (0.002)		
Prev. quarter real GDP growth					1.175** (0.504)	1.291** (0.480)
Real GDP growth 4 quarters ago					1.141** (0.495)	1.841** (0.522)
Previous quarter interest rate						-0.019** (0.007)
Interest rate 2 quarters ago						0.021** (0.007)
R <sup>2</sup>	0.03	0.01	0.01	0.01	0.14	0.26
F-stat	0.41	0.12	0.06	0.88	3.29	4.05
D.W. stat	1.57	1.60	1.60	1.62	1.68	1.73

\*\* Statistically significant at the 95% confidence level.

\* Statistically significant at the 90% confidence level.

### Rent Price models

Table 8 presents regression results using the quarterly growth rate of median real rents in Waitakere. The regression specifications used are similar to those for the house price analysis in the previous section. Model 1 tests for seasonal effects using quarterly dummies and finds no significant effects and no significant effect of DCs on median rent growth. Model 2 tests whether the simple average growth rate of median rents is significantly different after DCs are introduced compared to before and finds no significant effect. Models 3 and 4 control for simple time trends and again find no significant effects.

**Table 8** Regression results for the quarterly growth rate of **median real rents** in Waitakere.

Variable	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
Constant	0.002 (0.006)	0.004 (0.003)	-0.003 (0.006)	-0.002 (0.006)	-0.009* (0.005)	-0.026* (0.014)
Quarter 1 Dummy	0.004 (0.008)					
Quarter 2 Dummy	0.010 (0.008)					
Quarter 3 Dummy	-0.006 (0.008)					
Time trend			0.000 (0.000)	0.000 (0.000)		
DC dummy	-0.005 (0.007)	-0.005 (0.007)	-0.012 (0.009)	-0.129 (0.111)	-0.004 (0.006)	-0.006 (0.006)
DC dummy × time trend				0.002 (0.002)		
Current quarter real GDP growth					0.711** (0.272)	0.784** (0.278)
Real GDP growth 3 quarters ago					0.497* (0.270)	0.502* (0.298)
Real GDP growth 4 quarters ago					0.473* (0.264)	
Current quarter interest rate						0.004 (0.004)
Previous quarter interest rate						-0.001 (0.004)
R <sup>2</sup>	0.07	0.01	0.03	0.05	0.19	0.21
F-stat	1.20	0.48	0.89	0.97	3.32	2.90
D.W. stat	1.46	1.53	1.54	1.55	1.89	2.00

\*\* Statistically significant at the 95% confidence level.

\* Statistically significant at the 90% confidence level.

As with house prices, these simple models with seasonal effects or trends perform very poorly in terms of explaining growth rates of median rents. Models 5 and 6 incorporate other macroeconomic control variables, with various lags of these included to capture the structure of how they affect rents gradually over time. These models perform somewhat better at explaining median rent growth, however there is still a significant proportion of variation in quarterly growth rates that cannot be explained by these variables.

In all regression models, the DC dummy variable is statistically insignificant, indicating that there is no evidence that DCs have had an effect on quarterly growth rates of real median rents (when the other factors included in the regression models are controlled for).

Table 9 presents similar results using the quarterly growth rate of the **lower quartile rent** rather than the median rent. Again no significant effect of DCs is found when the other factors included in the regression models are controlled for.

**Table 9** Regression results for the quarterly growth rate of **lower quartile real rents** in Waitakere.

Variable	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
Constant	0.000 (0.006)	0.002 (0.003)	0.000 (0.007)	0.000 (0.007)	-0.014** (0.006)	-0.043** (0.014)
Quarter 1 Dummy	-0.003 (0.009)					
Quarter 2 Dummy	0.012 (0.009)					
Quarter 3 Dummy	-0.002 (0.009)					
Time trend			0.000 (0.000)	0.000 (0.000)		
DC dummy	0.004 (0.008)	0.003 (0.008)	0.000 (0.011)	-0.023 (0.129)	0.005 (0.007)	0.002 (0.007)
DC dummy × time trend				0.000 (0.002)		
Current quarter real GDP growth					0.808** (0.310)	0.920** (0.303)
Real GDP growth 3 quarters ago					0.714** (0.308)	0.733** (0.292)
Real GDP growth 4 quarters ago					0.514* (0.302)	
Current quarter interest rate						0.005** (0.002)
R <sup>2</sup>	0.07	0.01	0.01	0.01	0.19	0.24
F-stat	1.07	0.17	0.16	0.12	3.33	4.52
D.W. stat	1.72	1.78	1.79	1.79	2.04	2.26

\*\* Statistically significant at the 95% confidence level.

\* Statistically significant at the 90% confidence level.

Finally, Table 10 presents the results for the growth rate of **upper quartile real rents**. DCs are also statistically insignificant in these cases.

**Table 10** Regression results for the quarterly growth rate of upper quartile real rents in Waitakere.

Variable	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
Constant	0.002 (0.005)	0.004 (0.003)	-0.001 (0.006)	0.000 (0.006)	-0.003 (0.004)	-0.045** (0.016)
Quarter 1 Dummy	0.008 (0.007)					
Quarter 2 Dummy	0.005 (0.007)					
Quarter 3 Dummy	-0.004 (0.007)					
Time trend			0.000 (0.000)	0.000 (0.000)		
DC dummy	-0.005 (0.006)	-0.005 (0.006)	-0.010 (0.009)	-0.076 (0.103)	-0.005 (0.006)	-0.004 (0.006)
DC dummy × time trend				0.001 (0.002)		
Current quarter real GDP growth					0.482* (0.268)	0.615** (0.259)
Real GDP growth in previous quarter						0.446* (0.260)
Real GDP growth 2 quarters ago						9,465* (0.261)
Real GDP growth 4 quarters ago					0.513* (0.263)	0.687** (0.282)
Current quarter interest rate						0.008** (0.004)
Previous quarter interest rate						-0.013** (0.006)
Interest rate two quarters ago						0.010** (0.004)
R <sup>2</sup>	0.06	0.01	0.02	0.03	0.12	0.29
F-stat	1.03	0.56	0.68	0.58	2.59	2.62
D.W. stat	1.38	1.42	1.43	1.44	1.71	1.86

\*\* Statistically significant at the 95% confidence level.

\* Statistically significant at the 90% confidence level.

### Non-Residential Building Consent Models

Table 11 shows the results of various regression models that we used to assess the impact of DCs on business investment (as measured by non-residential building consents). Each column shows the results of a different regression model using some combination of the variables given in the table rows. Every model includes a DC 'dummy' variable, which takes the value one during the period in which DCs applied and zero in every other period. The coefficient in the DC dummy row of the table for each model therefore measures the average effect of DCs on non-residential building consents, controlling for the other variables included in each model.

All five models in Table 11 include a constant and also the lagged (previous quarter) value of real non-residential building consents. The latter is included to correct for serial correlation that was

found in the building consents data.<sup>16</sup> Model 1 simply includes quarterly dummy variables to account for possible seasonal effects in building consents. All of these dummy variables are statistically insignificant, indicating there are no strong seasonal effects. Model 2 only includes the constant and the DC dummy variable, which is equivalent to testing that the average quarterly value of building consents is different in the periods before and after DCs were introduced. In both models 1 and 2, the DC dummy variable is negative and weakly statistically significant. This confirms the visual observation from Figure 25 that the value of building consents appears lower in the post-DCs period. The coefficient values suggest that the average value of non-residential building consents reduced by about \$8.8 million per quarter after DCs were introduced. However, neither of these models controls for any other economic effects, so we cannot determine whether or not DCs are the cause.

**Table 11** Regression for the quarterly real value of total non-residential building consents in Waitakere (\$2008 m)

Variable	Model 1	Model 2	Model 3	Model 4	Model 5
Constant	42.866** (12.121)	45.424** (10.914)	43.878** (11.372)	47.080** (11.445)	76.548** (17.010)
Quarter 1 Dummy	0.895 (5.623)				
Quarter 2 Dummy	2.819 (5.634)				
Quarter 3 Dummy	5.219 (5.599)				
Time trend			0.128 (0.238)	0.253 (0.250)	
DC dummy	-8.723* (4.640)	-8.829* (4.512)	-12.014 (7.480)	38.006 (35.190)	0.168 (4.173)
DC dummy × time trend				-1.283 (0.883)	
Interest rate					-11.236** (3.524)
Previous quarter interest rate					14.138** (5.170)
Interest rate two quarters ago					-14.897** (3.477)
Interest rate four quarters ago					7.958** (1.634)
Real GDP growth three quarters ago					429.708** (210.032)
Previous quarter value of consents	0.430** (0.139)	0.426** (0.135)	0.417** (0.137)	0.348** (0.143)	0.282** (0.122)
R <sup>2</sup>	0.34	0.33	0.33	0.36	0.67
F-stat	4.37	10.88	7.23	6.09	10.91
D.W. stat	1.90	1.90	1.91	1.86	1.86

\*\* Statistically significant at the 95% confidence level.

\* Statistically significant at the 90% confidence level.

<sup>16</sup> Serial correlation means that the current quarter value is correlated with that in the previous quarter. Not correcting for this can lead to erroneous regression results.

Models 3 and 4 incorporate a linear time trend and the DC dummy variable. Model 4 also incorporates an interaction between the DC dummy and the time trend, to test if DCs have altered the trend. In both models, the trends and the DC dummy variables are statistically insignificant. Thus it does not appear there is any strong underlying trend between DCs and the value of non-residential building consents.

Finally, model 5 controls for relevant economic factors including interest rates (measured by the quarterly average 90-day interest rate) and the real GDP growth rate for New Zealand. This model performs quite well in that it is able to explain 67% of the variation in quarterly non-residential building consents in Waitakere. Various lags of the interest rate and GDP growth rate are included to account for the fact that changes in these variables may take time to flow through to investment decisions and thus take time to affect the value of building consents.

Model 5 indicates that once these macroeconomic effects are controlled for, there is no significant effect of DCs on the average level of real non-residential building consents in Waitakere. The reduction in the value of building consents observed in Figure 25 during the DCs period is largely attributable to higher interest rates, and once these are factored in, DCs have no statistically significant effect.

Figure 26 helps confirm this by showing the simple correlation between interest rates and non-residential building consents in Waitakere. The observed negative relationship between these variables is to be expected – higher interest rates increase the cost of capital which deters investment.

### **General Employment Models**

Table 12 shows the results for various different model specifications.

In all cases it is clear that the quarterly growth rates of employment in Waitakere are quite well explained by the quarterly dummy variables, which capture the seasonal pattern. For example, model 1 includes only the quarterly dummy variables and another dummy variable representing the introduction of DCs. The estimated coefficient on this variable can therefore be interpreted as the effect of introducing DCs on quarterly average employment growth, taking account of seasonal patterns. In model 1 this coefficient is estimated to be negative, suggesting that DCs have reduced average employment growth, however this coefficient is not statistically significant. Hence, there is no evidence of an effect of DCs on average employment growth (once seasonality is controlled for.)

The remaining models in Table 12 include a range of variables that control for other factors that may have also affected employment growth. The estimation results from these models reinforce our earlier conclusion – that DCs have not had any statistically-insignificant effects on employment growth in Waitakere. Essentially, quarterly employment growth in Waitakere appears to follow a regular seasonal pattern, with a constant average growth rate of about 0.67% per quarter. There appears to be no systematic change in this growth rate over time due to underlying trends, or any statistical relationship with GDP growth.

**Table 12:** Regression models for quarterly growth in total employment in Waitakere (standard errors in brackets).

Variable	Model 1	Model 2	Model 3	Model 4	Model 5
Constant	0.025** (0.003)	0.023** (0.004)	0.022** (0.004)	0.023** (0.003)	0.025** (0.003)
Quarter 1 Dummy	-0.063** (0.003)	-0.063** (0.003)	-0.063** (0.003)	-0.064** (0.003)	-0.063** (0.004)
Quarter 2 Dummy	0.011** (0.004)	0.010** (0.004)	0.010** (0.003)	0.011** (0.003)	0.011** (0.004)
Quarter 3 Dummy	-0.018** (0.003)	-0.017** (0.003)	-0.018** (0.003)	-0.017** (0.003)	-0.018** (0.004)
Time trend		0.0002 (0.0003)	0.0003 (0.0003)		
DC dummy	-0.001 (0.003)	-0.003 (0.005)	0.023 (0.018)	0.001 (0.003)	-0.001 (0.003)
DC dummy × time trend			-0.001 (0.001)		
Real GDP growth				0.227 (0.145)	
Previous quarter real GDP growth					-0.020 (0.154)
R <sup>2</sup>	0.95	0.95	0.96	0.96	0.95
F-stat	132.93	104.32	91.77	112.75	98.80
D.W. stat	2.39	2.45	2.68	2.54	2.39

\*\* Statistically significant at the 95% confidence level.

### Construction Employment Models

Table 13 tests for a relationship between construction industry employment growth and DCs by estimating different regression models (as in the previous subsection). Again quarterly dummy variables were included to capture seasonal patterns, although these were less pronounced for construction employment growth than for overall employment growth. The results from model 1 test for a significant effect of DCs on quarterly average construction employment growth, accounting for the seasonal pattern. In this case the coefficient on the DC dummy variable is estimated to be positive, but it is again statistically insignificant.

The relatively poor performance of this regression ( $R^2$  of 0.24) compared to the comparable regression for overall employment ( $R^2$  of 0.95) show that seasonal factors alone do not do a very good job of explaining quarterly construction industry employment. The other models in Table 13 attempt to improve on this by introducing additional explanatory factors, including time trends, real GDP growth and overall employment growth. The model that performs best in terms of explaining the pattern of quarterly construction industry growth includes overall employment growth in the past two quarters (model 5). In this model the DC dummy variable has a positive coefficient that is weakly statistically significant. However, it is difficult to think of a reason why DCs could have *increased* growth in employment. This, together with the weak level of statistical significant leads us to conclude that there is no strong evidence that DCs have had any impact on construction industry employment growth.

**Table 13** Regression results for quarterly growth in construction employment in Waitakere (standard errors in brackets).

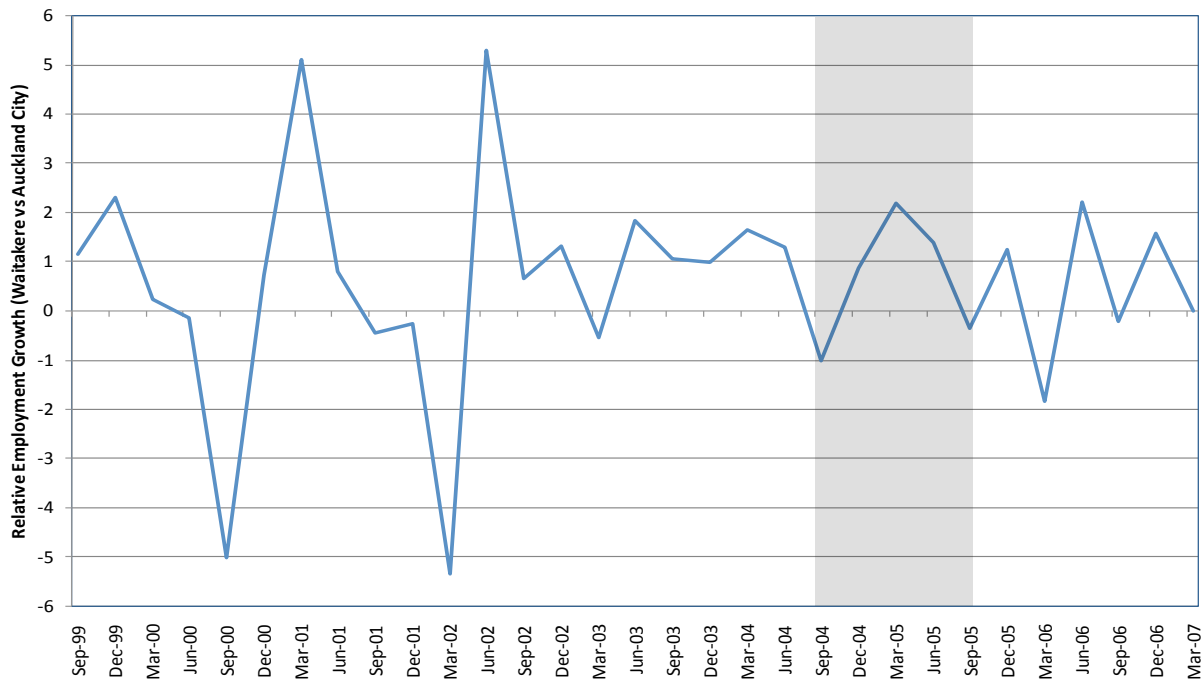
Variable	Model 1	Model 2	Model 3	Model 4	Model 5
Constant	0.029** (0.010)	0.017 (0.015)	0.012 (0.016)	0.022* (0.012)	-0.034* (0.020)
Quarter 1 Dummy	-0.031** (0.014)	-0.033** (0.014)	-0.032** (0.014)	-0.035** (0.014)	0.089** (0.042)
Quarter 2 Dummy	-0.013 (0.014)	-0.014 (0.014)	-0.015 (0.014)	-0.012 (0.014)	0.020 (0.031)
Quarter 3 Dummy	-0.030** (0.014)	-0.029** (0.014)	-0.030** (0.014)	-0.029** (0.013)	-0.031 (0.023)
Time trend		0.001 (0.001)	0.002 (0.001)		
DC dummy	0.012 (0.010)	-0.006 (0.019)	0.068 (0.073)	0.016 (0.011)	0.016* (0.008)
DC dummy × time trend			-0.003 (0.003)		
Real GDP growth				0.683 (0.602)	
Overall employment growth					2.265** (0.658)
Prev. quarter overall employment growth					1.249* (0.656)
R <sup>2</sup>	0.24	0.28	0.31	0.28	0.55
F-stat	2.08	1.92	1.79	1.94	4.77
D.W. stat	1.34	1.38	1.47	1.36	1.89

\*\* Statistically significant at the 95% confidence level.

\* Statistically significant at the 90% confidence level.

Finally, we can again test the effects of DCs on construction industry employment growth in Waitakere by using relative employment growth in Waitakere compared to Auckland City. Figure 36 shows the relative quarterly growth rate of construction industry employment in Waitakere compared to Auckland city, with the shaded period showing the four quarters in which DCs applied in Waitakere but not Auckland city.

**Figure 36:** Relative quarterly construction employment growth in Waitakere versus Auckland City.



As before, we can test whether the ratio of quarterly construction industry employment in Waitakere over Auckland city is significantly different during the shaded period (where DCs applied in Waitakere but not in Auckland city). The average ratio of construction industry employment growth prior to DCs applying in Waitakere is 0.62, and the average during the period in which DCs applied in Waitakere but not Auckland city is 0.86. However, this difference in the averages is not statistically significant.