# Land value uplift from light rail

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**Abstract**

Land value gains attributable to the light rail system on the Gold Coast, Australia, are estimated. Using the full history of statutory land valuations of Gold Coast properties, a model of location-specific gains is estimated, allowing for price effects at multiple distances from stations across time. Total value gains to nearby landowners are $300 million, or 25% of the capital cost of the project, This estimate is net of automatic property tax increases of $4.8million in 2015-16. Substantial additional scope to fund transport investment from value gains is apparent.

**Keywords:** Land value, betterment, light rail

## 1 Introduction

On 20 July 2015 the Gold Coast City Council (GCCC) celebrated the first anniversary of Stage One of its $1.3 billion light rail (GCLR) system, recording 6.5 million passenger trips since opening, or around 18,000 per day. With a population of around 546,000, the capital investment for this first Stage of the light rail system was about $2,400 per resident, or $6,000 per household. Stage One of the GCLR system comprises 16 stations, stretching 13km from the Gold Coast University Hospital in the North, to Broadbeach in the South. Stage Two of the GCLR system began construction in mid-2016, linking the Northern end of Stage One with 7.3km of track to the Helensvale heavy rail station (which links to Brisbane), and adding three additional stations.

This paper seeks to understand the distribution of the economic benefits from the Stage One GCLR investment by looking at the degree to which the travel time reductions and improved accessibility to properties near the light rail corridor became capitalised into property site values. By doing so, it demonstrates the scale of locational value gains that lead to automatic increases in government revenues, and the residual value gains that could be redirected towards infrastructure funding, based on a principle of beneficiary pays, by way of a land value capture mechanisms. Such mechanisms are now major topic of debate in Australian politics, yet there is almost no evidence in the literature of the size of land value gains from recent infrastructure projects in Australia (Tsai *et al.* , 2015; Mulley, 2014). The wider international literature has estimated land value effects from light rail investment ranging between -19% and 30%, which provides little guidance for local policy assessment (Jones, 2015).

A previous attempt to discern whether value gains to landowners had been made from this project was limited by the granularity of their data, which was aggregated geographically into

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blocks with populations with 10,000 people on average, and also by the use of residential sales prices, which are subject to a greater degree of speculative variation than estimated land values for all sites (Jones, 2015). Our data includes the State Valuer General's estimated land values for every site on the Gold Coast, allowing for finer geographic granularity and potentially less speculative price variation compared to sales data.

Our complete property census panel dataset allows us to determine the timing of value gains by looking at land value deviations over the period between the announcement, construction, and completion of the project (Mulley, 2014). We therefore focus on the interaction terms of time and distance to light rail stations, following McIntosh *et al.* (2016), but in addition accounting for auto-regression of land valuations. Applying the estimated coefficients of this model to our land size and value data allows us provide a reasonable estimate of the total value gains to nearby landowners from this public infrastructure investment. These gains are approximately $300 million, accruing primarily to landowners within 400m of GCLR stations who saw their land values increase 7.1% higher than otherwise. These estimated value gains are around a quarter of the capital cost of the Stage One GCLR, and are net of any additional council rates and tax obligations imposed across the city to fund the GCLR. They also do not account for any potential longer term differences in land value gains arising from the GCLR which would be automatically captured in land value taxes.

## 2 Background

Figure 1 provides a timeline of the public policy development leading to the construction of Stage One of the GCLR. It is important to keep in mind that value gains due to this investment may be captured in market prices prior to its construction as the certainty of the GCLR investment increases. As such, we expect some deviation in prices prior to completion of construction in 2014, though how temporary reductions in sales volumes due to the disruptive construction period affects market values is unclear. The key dates of interest involve the public provision of information about the timing, location and scope of the GCLR system.

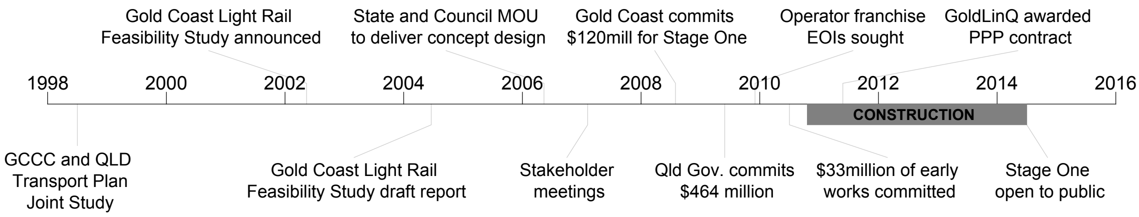


Figure 1: Timeline of key dates in the implementation of the Gold Coast Light Rail

The first public announcement of the intention to build a light rail system on the Gold Coast came in the 1998 transport plan conducted by the city council in conjunction with the Queensland State Government. From this point onwards it seems reasonable to suggest that property buyers in the dense tourist corridor that the GCLR traverses would have had valid expectations of future transit investment, yet the exact location of stations and extent of the GCLR system was not apparent.

The second major public announcement was in 2004, when the GCLR feasibility study report was released. In this document, staging and proposed station locations became fully public, despite some uncertainty remaining about the exact extent of Stage One, and the timing of the investment, given that funding the GCLR would require future political cooperation from multiple levels of government.

By 2006 the scope of Stage One was certain, and in early 2007 a series of public stakeholder meetings was conducted to further improve the finer details of station design and access. Full financial commitment from the Council and State Governments occurred in 2009, with tendering for construction coming quickly after. Construction took a little over three years, and was completed in July 2014. While construction works had short term disruptive effects on residents and commercial operations in the GCLR corridor and may have been capitalised into prices, they are likely to be relatively minor.

Apart from the timeline of the light rail development, there are two other main features of the policy environment that are relevant to this study. First is the introduction of a City Transport Improvement Charge in 2005, which was increased by $17.50 per property in June 2011 to contribute to funding the GCLR and other transport projects in the city. This annual ongoing charge raised $29million in 2015 for the Council (Blair, 2015). Hence, the land value effects estimated here are also net of the effects of this additional charge to every property owner.

A complementary institutional change of note is the GCCC has been reducing minimum car parking requirements for developments along the GCLR transit corridor, further contributing to gains by landowners. Hence, estimates of value gains in this paper may be in part attributable to these planning changes, though it is unlikely they would have been made without the GCLR transport investment.

# 3 Data and methods

## 3.1 Data

The full suite of historical land valuations for all sites in the GCCC area was obtained. This data was geocoded and matched with zoning information supplied in open-data portals by the GCCC. In this type of data, attached dwellings, and other property titles that involve vertical partitioning, are represented by a single land value attributable to the building's incorporated body.

The site details include: address, size, title type (attached or detached types), and sub-areas (parishes and divisions) and zoning. Notably, across the city the land values in 2014 were about $100,000 per capita, which is a little below the national average land value of around $180,000 per capita, utilising all land, which includes high value property outside of the major cities, such as agricultural property (Lowe, 2015). Derived site details include the distance from GCLR stations, and the distance from the coast, which is a major determinant a prices.

Table 1 summarises the data used in this study. Notably, the sites near to the GCLR stations are smaller, higher density, closer to the coast, and exceptionally high value on a per square metre basis, being sixteen times the average value for the whole city area. Figure A.1 shows the geographic distribution of the GCLR station catchments in relation to the city area as a whole.

Queensland Government valuers have confirmed that in producing their routine valuations that sales activity in the high-density corridor surrounding the GCLR was closely monitored to ensure

Table 1: Summary of Gold Coast 2015 property valuations data

| | GCCC Area | Distance to station 0-400m | 400m-2km |
|---|---|---|---|
| Number of sites | 127,222 | 1,324 | 13,935 |
| Mean lot size | 5,088 | 1,021 | 898 |
| Share attached property types | 0.69 | 0.81 | 0.91 |
| High density zoning* | 0.02 | 0.55 | 0.03 |
| Mean distance to coast (km) | 7.20 | 1.20 | 2.83 |
| Mean distance to GCLR station (km) | 8.64 | 0.25 | 1.25 |
| Mean land value ($2015/sqm) | 2,985 | 178,620 | 2,318 |
| Total land value ($2015 million) | 59,202 | 4,223 | 9,125 |

Total data size is 127,792 properties, with 2,233,289 valuation data points over a maximum of 69 years for a single property.

* High density zones include Centre, Special Purpose, and High Density Residential.

a fine granularity and timeliness of valuations in these areas. They noted that there were short-term disruptive effects for commercial and residential tenants, but that values appeared to grow in relative terms despite these disruptions, on the basis of expectations of the future local amenity and accessibility.

## 3.2 Methods

To generate a good fit to the data on the value gains attributable to proximity, and the timeliness of such gains, we estimate the following difference-in-difference model with a vector of treatment variables that capture the interaction of time and distance-to-GCLR attributes, shown in Equation 1.

$$y_{i,t} = X_i\beta + y_{i,t-1}\delta + \alpha_t + D_i\omega + D_{i,t}\gamma + \varepsilon_{i,t} \tag{1}$$

Here, $y_{i,t}$ is the natural logarithm of land value per sqm for lot $i$ at time $t$, and $y_{i,t-1}$ is the auto-regressive term. $X_i$ is a matrix of site characteristics unchanged through time, including location in terms of distance to GCLR stations, distance to coast, council sub-areas (parishes and divisions) and land size. $\alpha_t$ is the coefficient estimate of vector of time dummy variables capturing city-wide variations over time, and $D_i$ contains time-independent dummy variables at incremental categories for distance from GCLR stations (such as 0-100m, 100-200m, and so on). The interaction term $D_{i,t}$ is a matrix of interaction terms with distance and time dummy variables from 2001 onwards, which allows us to focus on a period capturing the first major feasibility study all the way to construction completion, and examine land value effects from the estimation of $\gamma$. $\varepsilon$ is an error term. To provide some sensitivity testing, two versions of the model are estimated; the full model which includes sub-area controls in $X_i$, and a restricted model that does not. Table A.1 of the Appendix explains the main variables included in the model.

There are a number benefits of using this model. First, the treatment interaction terms allow us to observe the timing of relative value gains for land near the GCLR. Second, the multiple distance categories within a close radius of GCLR stations allow for fine granularity of the variation of value gains due to proximity. Third, it allows us to pre-multiply the $\widehat{\gamma}$ estimates for any year to the vector of transformed areas of land in the sample to establish the total value gain attributable to the light rail investment. This is achieved with the following transformation.

$$V_{year} = \sum_i e^{X_i\hat{\beta} + y_{i,t-1}\hat{\delta} + \hat{\alpha}_t + D_i\hat{\omega} + \sigma^2/2} \times A_i \times D_{i,year} \times (e^{\hat{\gamma}_{i,year}} - 1) \times year \qquad (2)$$

This method estimates the value gains at the average of the distance rings, which we expect to show a 'cone' of rising value gains with closer station proximity in critical years of the project.

However, this method allows a substantial degree of modeller choice over which year's value differential can be reasonably argued to be attributable to the GCLR, and at which distances. Can the deviation in 2009, when funding was committed, be added to the deviation in 2015, when construction was completed? And can the price deviation for all distances out to 2km be attributed to the GCLR, or just to distances of 400m? Without seeing the results of the model fitting, these decisions cannot be made with any solid justification.

# 4 Results

## 4.1 Model fitting

There are 202 independent variables in the full model, taking into account the various sub areas, coastal distance, zoning and property type controls, and including the set of 108 time and distance interaction terms of interest (9 distance categories across 12 years). Removing the first year's data from each property to ensure complete use of lagged terms leaves 2,105,497 data points. In the restricted model, which excludes sub-area controls, there are 144 independent variables.

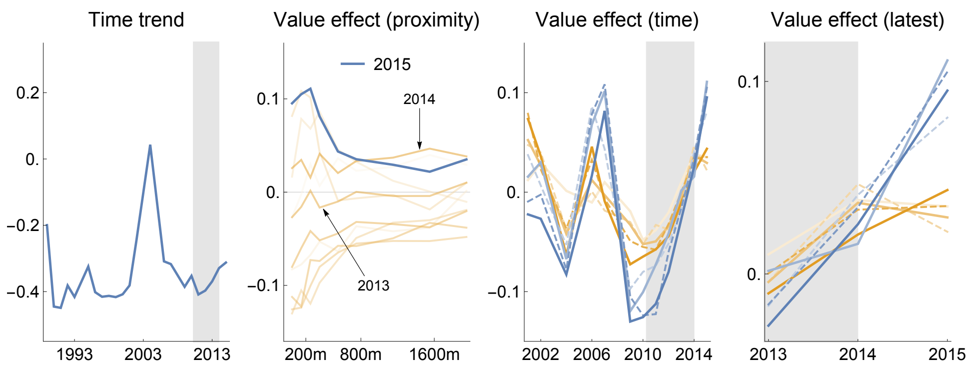


Figure 2: Main model results (shading indicates construction period)

The left panel of Figure 2 plots the transformed time trend of the full model, showing the sudden property boom in 2004, while the next panel shows the $e^{\hat{\gamma}} - 1$ transformation of the interaction terms for the years 2007 onwards, plotted by distance, with the highlighted 2015 price deviations resembling the expected cone of rising value effects with station proximity. The last two panels show the time trend for the interaction terms at each distance. The first of these shows the total

12 years of modelled price deviations, with the a notably synchronised cycle amongst all distances until 2015. The right panel shows just the final three year's price deviations by distance, with a clear divergence by distance appearing in 2015, the year after construction was completed. Sites closer than 400m to a station saw a 10% deviation in that year, compared to a 3% deviation for sites between 400m and 2km. Table A.3 of the Appendix shows the coefficient estimates and standard errors for all the interaction terms in the full model, and Table A.2 shows the other coefficient estimates in the full and restricted models.

A number of features of these model results are worth mentioning, and inform the decision about which value gains are attributable to the GCLR. First, although the fit of the model is high in both the full and restricted models, there remains some unexplained cyclical variation, which can be observed in the pattern of time-variation in the price deviation trends in the third panel of Figure 2. From 2008 to 2013, when the property market fell, the land value of the sites near the GCLR stations saw the largest falls, somewhat in proportion to their station proximity, and perhaps partly due the expectations of construction disruptions. Untangling the land value cyclical from the GCLR value effect therefore requires further some judgement, and the main planned approach of adding persistent price deviations at critical times in the project at all distances, seems not to identify the marginal value effect of the GCLR.

Second, despite this underlying cycle, the divergence in valuation paths seen in the right panel, which splits land value growth by proximity in the years before and after GCLR construction was complete, appears to more cleanly capture the marginal value effect from the GCLR. Hence, a calculation of the value differential attributable to this divergence is likely to be closer to the true marginal effect of the GCLR.

Third, the timeline of planning, funding, and construction seems to bears little obvious relationship to the land value data. Standard theory suggests that value gains from future investments would be capitalised into land values when the risk of that investment diminishes, such as in 2009 when funding by multiple levels of government was committed to the project. The standard expectation is that properties close to the GCLR would see a small price gain in that year, and perhaps a small negative deviation in construction years with another larger positive deviation upon completion, the net effect being sum of the value deviations in those critical years from Equation 2. This expectation is not borne out in the data, which instead only shows obvious value divergence with station-distance after the construction was completed in 2014 which does not resemble earlier cyclical patterns.

## 4.2 Total value gains

Applying Equation 2 to all distance ranges in the most recent three years of data is shown in the first three columns of Table 2. For the years 2009 to 2012 these deviations are also negative, as expected from the model results in Figure 2, as is the sum of deviations in all years from 2009 to 2015. We can thus either conclude that the GCLR has a large negative effect on local land values, or that there are cyclical factors that predominately determine these results.

In light of the observed patterns in our models results, we pursue an alternative identification method that takes into account only the net gain for the sites within 400m in 2015, after removing the mean price deviation from sites in further distance categories. This gives a 7.09% relative value gain in the full model, and 7.15% in the restricted model. The closeness of these estimates shows that the restricted model still closely captures this important value variations. These net gains are then applied to the model-predicted land values within 400m, and as a final check

Table 2: Total marginal value effects ($ '000)

| | Value deviation (full model) | | | Net method, 2015 values | | | |
|---|---|---|---|---|---|---|---|
| | | | | Predicted values | | Actual values | |
| | 2013 | 2014 | 2015 | (full model) | (restricted) | (full model) | (restricted) |
| 0-100m | -9,173 | 9,058 | 39,990 | 29,782 | 48,506 | 35,332 | 35,597 |
| 0-200m | -21,018 | 32,825 | 119,625 | 83,678 | 139,327 | 100,408 | 101,160 |
| 0-300m | -18,770 | 55,870 | 284,870 | 189,252 | 318,496 | 227,673 | 229,379 |
| 0-400m | -26,617 | 86,248 | 355,232 | **250,704** | **421,348** | **299,545** | **301,790** |
| 0-600m | -36,212 | 107,459 | 407,494 | | | | |
| 0-800m | -35,896 | 149,002 | 458,349 | | | | |
| 0-1.2km | -42,370 | 213,050 | 516,138 | | | | |
| 0-1.6km | -48,532 | 290,018 | 558,241 | | | | |
| 0-2km | -32,082 | 360,711 | 632,360 | | | | |

Dollar values relate to their respective year.

are also applied to the actual land values in those areas. These results are in the final four columns of Table 2, which suggest a range between $250 million and $421 million in gains directly attributable to the GCLR. In the remaining discussion and analysis we adopt a figure of $300million.

Because of the remaining uncertainty about when exactly the value gains from the GCLR entered market prices, and because of the disruption to site access during construction, the most conservative estimate of the value gains purely attributable to the GCLR are those applying the value differential for the closer sites that arose in 2015 (which are in bold text in Table 2). However, the true total land value gains attributable to the GCLR could be somewhat higher than this estimate if there are earlier gains which we have failed to identify in our model, and if there are subsequent differential gains that can reasonably be attributed to the GCLR. Because the value of land in the GCLR catchment is so high, at $4.2billion in 2015, even tiny changes in percentage value deviations generates large changes in total value gains.

# 5 Discussion and conclusions

Using the full suite of statutory land valuations in the Gold Coast, Australia, we have been able to conservatively estimate the marginal land value gains due to direct accessibility improvements from the construction of a new light rail network of $300 million. The inherent statistical difficulties in isolating this marginal effect required a judgement call based on statistical model fitting, using only the differential value gains in 2015 of 7.1% for sites within 400m of the GCLR stations. The size of these gains is in keeping with the literature on land value effects from light rail in the review of Jones (2015), who found a 9.5% average price increase, and is similar to identifiable gains in Sydney for ferry and heavy rail stations, which are 4.5% and 8.0% of total property value (land and buildings) respectively (McIntosh *et al.* , 2016).

This estimate can be used to inform the public policy discussion about capturing land value gains to fund transport infrastructure. GCCC currently levies annual rates on property owners at 0.4% to 2.7% of the average land value over the past three years, depending on the type of land use. The overall average rate based on the total land value in the GCCC area in 2015 is 1.6%. Applying this average to our most conservative estimate of marginal land value gains attributable to the GCLR suggests an $4.8 million increase in annual revenue for the council, which is a 0.5% increase. In addition, the incremental change to the transport levy in 2011 represents around $4.5 million in annual revenue for the council in the 2014-15 financial year. Recall that the value gains estimated here are already net of both the automatic financing effect and the additional transport levy, showing just how large the scope is for further transit funding mechanisms through direct charges of local beneficiaries. At a 5% market interest rate, this capital value is equivalent to an annual flow of income of $15 million.

State governments also levy taxes on land values, though in Queensland there are exemptions for land holdings under $600,000 in value. After this, the marginal rate is between 1% and 1.75%. We can therefore estimate the additional revenue available to the state government from land value increases due to transport investment in the situation where there are no exemptions. At a 1% rate, this would be an increase of approximately $2.5million in annual land tax income from the value gains due to the GCLR, in addition to the other local council revenues already mentioned.[1]

One of the primary beneficiaries of public investment in new transport infrastructure are landowners in locations that obtain improved accessibility. However, rarely do these beneficiaries contribute to the funding of the infrastructure in proportion to the benefits they accrue. By estimating the land value gains to landowners near the GCLR stations, we have shown that such gains represent around a quarter or more of the upfront capital cost of the GCLR, even after the automatic increase in council rates and the incremental city-wide increase in the transport levy. Routine assessment of the size of land value gains from transport infrastructure would inform discussion on the distributional effects on investment, including whether political favouritism was present, as it often is in city planning (Murray & Frijters, 2016), and the scale of the total economic benefits of the infrastructure investment.

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[1]Because a higher land tax rate will have a price effect, this revenue estimate is calculated by solving the simultaneous equations $V_1 = \frac{R}{i}$ and $V_2 = \frac{R-tV_2}{i}$ for $V_2$, the value change in the presence of the land tax, at the tax rate, $t = 0,01$, and the capitalisation rate, $i = 0.05$, and where $V_1$ is the estimated land value gains assuming total exemption from state land value taxes. The revenue estimate is then $tV_2$.

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# Appendix

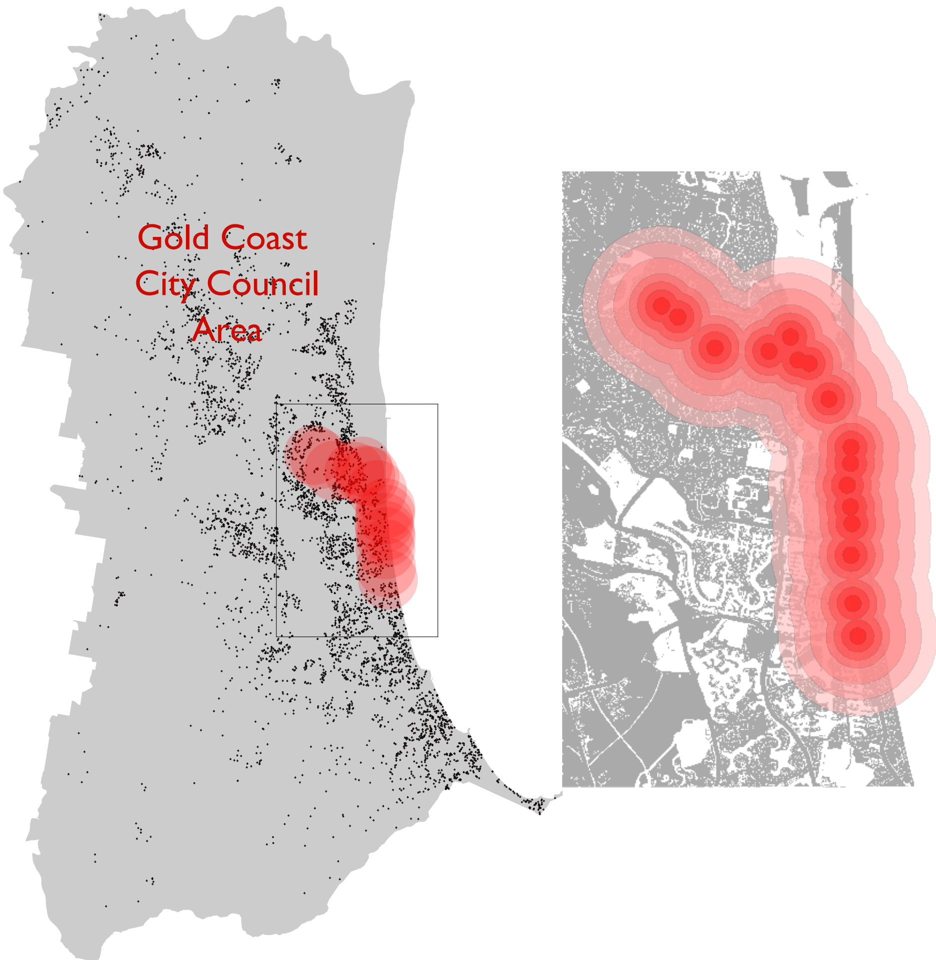


Figure A.1: GCCC region with 2km radius of light rail stations and sample of property locations

Table A.1: Description of model variables

| Variable | Type | Details | Description |
|---|---|---|---|
| Area | Continuous variable | Natural log of lot size in square meters | Attached titles are a single lot |
| Division | 13 dummy variables | Divisions have numerical names, 1..14 (Division 1 is reference) | Electoral area divisions |
| Parish | 12 dummy variables | Parishes are: Albert, Barrow, Boyd, Cedar, Coomera, Currigee, Darlington, Gilston, Nergane, Numinbah, Pimpama, Tallebudgera Mudgeeraba, (Albert Parish is reference) | Geographic area of title system |
| Type | 1 dummy variable | Attached, Detached (Detached is reference) | Attached or detached title type |
| Zone | 16 Zone dummy variables | Emerging community, High Density Residential, Limited Development, Low Density Residential, Low Impact Industry, Medium Density Residential, Medium Impact Industry, Mixed Use, Neighbourhood Centre, Rural, Rural Residential, Special Purpose, Sport and Recreation, Township, Unzoned (Emerging community is reference) | Town planning controls |
| Coast Distance | Continuous | Natural log of kilometres of coast from site | Refers only to the eastern beach |
| Time | 26 dummy variables | 1988-2014 missing 1994, 2003, 2005 (1988 is reference Time) | Year of the site valuations |
| Station distance | 9 dummy variables | <100m, 100-200m, 200-300m, 300-400m, 400-600m, 600-800m, 800m-1.2km,1.2-1.6km, 1.6-2km (>2km reference) | Sites in each range are 1, others 0 |
| Valuation | Continuous | Ln($/sqm) in each year | Statutory land valuation |

Table A.2: Model coefficient estimates

| | Full model | Restricted model |
|---|---|---|
| Constant | 1.07 | 1.02 |
| Lag value | 0.95 | 0.96 |
| Ln(area) | -0.03 | -0.03 |
| Distance to coast (ln) | -0.02 | -0.02 |
| 2004 | *0.04* | *0.02* |
| 2006 | -0.37 | -0.40 |
| 2007 | -0.38 | -0.41 |
| 2009 | -0.49 | -0.52 |
| 2010 | -0.43 | -0.46 |
| 2011 | -0.53 | -0.56 |
| 2012 | -0.51 | -0.54 |
| 2013 | -0.46 | -0.49 |
| 2014 | -0.40 | -0.43 |
| 2015 | -0.37 | -0.41 |
| <100m | 0.015 | 0.008 |
| 100-200m | 0.008 | *0.002* |
| 200-300m | 0.010 | 0.007 |
| 300-400m | *-0.003* | *-0.002* |
| 400-600m | 0.005 | 0.005 |
| 600-800m | -0.005 | -0.004 |
| 800m-1.2km | *0.001* | *-0.000* |
| 1.2-1.6km | 0.004 | 0.005 |
| 1.6-2km | *-0.000* | 0.004 |
| Sub-area controls | Yes | No |
| $R^2$ | 0.99 | 0.83 |

Italicised figures indicate that coefficient estimates have p-values >0.01.

Table A.3: Coefficient estimates for time and distance interaction terms (full model)

| | Year of interaction term | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Distance | 2001 | 2002 | 2004 | 2006 | 2007 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 |
| 0-100m | -0.02 | -0.03 | -0.09 | 0.02 | 0.08 | -0.14 | -0.13 | -0.12 | -0.08 | -0.03 | 0.03 | 0.09 |
| | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 |
| 100-200m | -0.01 | 0 | -0.08 | 0.08 | 0.1 | -0.11 | -0.13 | -0.13 | -0.06 | -0.02 | 0.03 | 0.10 |
| | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 |
| 200-300m | 0.02 | 0.03 | -0.07 | 0.07 | 0.1 | -0.13 | -0.11 | -0.08 | -0.04 | 0 | 0.02 | 0.11 |
| | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 |
| 300-400m | 0.04 | 0.01 | -0.05 | 0.08 | 0.04 | -0.1 | -0.08 | -0.08 | -0.05 | -0.02 | 0.04 | 0.08 |
| | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0 |
| 400-600m | 0.07 | 0.04 | -0.07 | 0.04 | -0.01 | -0.08 | -0.07 | -0.06 | -0.05 | -0.01 | 0.02 | 0.04 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 600-800m | 0.08 | 0.02 | -0.04 | 0.03 | -0.01 | -0.05 | -0.06 | -0.06 | -0.03 | 0 | 0.03 | 0.03 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 800-1.2km | 0.05 | 0.03 | -0.04 | 0.01 | 0 | -0.03 | -0.05 | -0.05 | -0.03 | 0 | 0.04 | 0.03 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1.2-1.6km | 0.05 | 0.04 | -0.04 | 0 | -0.02 | -0.03 | -0.05 | -0.03 | -0.04 | 0 | 0.05 | 0.02 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1.6-2km | 0.01 | 0.03 | 0 | -0.01 | 0.01 | -0.02 | -0.05 | -0.04 | -0.02 | 0.01 | 0.04 | 0.03 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

Shaded rows shows standard errors.
$R^2 = 0.99$. N = 2,105,497 (first valuation year for each property is removed to provide a full suite of lagged valuation variables)