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Road traffic noise impacts and property turnover

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ABSTRACT

It is generally accepted that adverse impacts from road traffic noise will be reflected in lower property values and rental prices for affected apartments and houses. However, the impact that road traffic noise has on rental property turnover rates is not as well established. This study explored that question by modelling the road traffic noise levels across six suburbs in Queensland and correlating the calculated noise levels with rental turnover rates. The results suggest that the properties fronting major roads, which are exposed to higher noise levels, generally have greater turnover rates than properties with lower road traffic noise levels within the same suburbs. It is suggested that renters underestimate the impacts of road traffic noise on their day-to-day lives, causing them to relocate in a shorter amount of time than renters of similar properties with lower noise exposure levels.

1 INTRODUCTION

Approximately 31% of the Australian population rents where they live. People choose where they live based on an extensive list of parameters including proximity to work, family, friends and entertainment, home size, land size, number of bedrooms and more. One key element is cost, which often introduces sacrifices in some personal preferences. An example may be that, for the budget one has, a view may be sacrificed to obtain more living space, or someone may forgo a yard to have proximity to public transport.

Another consideration is noise. If someone is keen to live in a specific suburb where the rent is higher, they may consider a cheaper home on a busy street; thus, knowingly exposing themselves to higher noise levels to earn other benefits that suburb may provide. It is suggested that, in some instances, people underestimate the impact these higher noise levels may have on their wellbeing and, once the lease is up (or prior), are more likely to relocate. This potentially exposes the property owner to higher periods of time where the property is not leased. Given the costs and lost income for landlords resulting from vacancy and re-letting, there could be a real economic impact to landlords due to high noise levels, in addition to the impacts on the tenants themselves.

To understand if this hypothesis is correct, the road traffic noise levels were calculated at every façade of every storey of every building throughout six suburbs in Brisbane, namely Ashgrove, Camp Hill, East Brisbane, Everton Park, Kedron and Moorooka (refer Figure 1). These suburbs were chosen as the transport noise levels were dominated by road traffic, with minimal influence from rail or aircraft throughout the entire suburb. The rental history was interrogated for these properties, allowing a comparison between noise levels and property turn over. Considerations have also been made to minimise the effect of property value, type (e.g. houses versus apartments) and size.

2 CALCALUATION OF ROAD TRAFFIC NOISE LEVELS

To calculate road traffic noise levels, national transport noise maps were developed. These maps, created from noise modelling within the SoundPLAN noise modelling package, calculated the road, rail and aircraft noise exposure levels at every façade of every floor of every building within Australia. The road traffic noise models consider the noise contribution from day, evening and night traffic counts, traffic speeds and heavy vehicle percentages for every road, ranging from motorways to cul-de-sacs.

Data from all railway lines were included, featuring train types, numbers, speeds, track radius curvature etc. Additionally, all aircraft movements identified using flight tracking software were also incorporated. This data included each aircraft's type, altitude and ground speed, captured every 15 seconds over a period of 2 weeks throughout the entire country. Aircraft departure and arrival noise levels were sourced from the Eurocontrol Aircraft Noise and performance database. The national model also featured almost 16 million buildings and hundreds of kilometres of noise barriers, based on historical works provided by relevant State governments.

To calculate the road traffic day, evening and night time values, a standard was required to allow an hourly number of passenger vehicles, heavy vehicles, passenger vehicle speeds and heavy vehicle speeds. In addition, an LAeq noise level was sought to compare calculated noise levels with those published within the World Health Organiztaion's recommendations for noise exposure. SoundPLAN's implementation of the German Schall algorithms permitted both of these requirements.

Historical modelling with a similar dataset using the Calculation of Road Traffic Noise (CoRTN) standard allowed verification of the noise model against 92 road traffic noise measurements throughout the Toowoomba region. On average, the CoRTN model over-predicted the measured $L_{A10\ 18hr}$ noise levels by 1.7 dBA with a standard deviation of $\pm$ 2.3. It is acknowledged that at this stage no verification exercise has been completed using the Schall standard for the day, evening and night time periods.

The maximum and minimum LAeq day, evening and night time façade noise map results from the noise model were assigned to the dwellings each property boundary. No noise levels were assigned to garages, sheds or other non-residential buildings (e.g. commercial properties). Over 18,900 dwellings were identified and assigned noise exposure levels throughout the six suburbs.

The purpose of the national noise map was primarily to support real estate in the provision of property reports and supporting information for property valuation forecasts, governments (both State and Local) for planning overlays, and to assist in research, in particular health and epidemiology.

3 RENTAL HISTORY DATA

CoreLogic RPData provides property sales and rental history data throughout Australia. The Corelogic datasets were accessed through the online RPData Professional platform to understand the rental history for properties that are three- and four-bedroom houses only, with a sale price in the range of $500k to $700k. These values were nominated based on the median house value for greater Brisbane ($524k) and the median house value for Brisbane only ($673k) to remove properties are the lower and higher ends of the spectrum. This was done to obtain a homogeneous sample, limiting the impact of other variables influencing rental turnover, which could include:

- property price impacting turnover due to socioeconomic factors
- dwelling type: apartment vs flat vs house.
- size of the dwelling.

The sample was further restricted to remove the impact of sales on rental turnover. It is possible that a change of ownership (such as from an owner occupier to an investor) would distort the rental history, adding unexplained error to the data. Properties selected were limited to those with:

- no sales in the past 5 years
- any rental history (not limited to the past 5 years).

These restrictions also minimised the amount of time (and cost) spent manually recording data from the portal as rental data was not available as a direct export. The rental history data was then matched to property noise data based on the lot and plan identifiers available on both datasets. This ensured accurate matching and is more likely to produce accurate results than matching on addresses. Samples from both datasets where no match was found were discarded. After restricting the sample, 340 properties remained for comparison.

4 CRITERIA AND THE WORLD HEALTH ORGANIZATION RECOMMENDATIONS FOR ROAD TRAFFIC NOISE EXPOSURE

The World Health Organization has published a set of recommendations for environmental noise. For road traffic, these guidelines are as follows:

- For average noise exposure, the Guideline Development Group (GDG) strongly recommends reducing noise levels produced by road traffic below 53 decibels (dB) Lden, as road traffic noise above this level is associated with adverse health effects.
- For night noise exposure, the GDG strongly recommends reducing noise levels produced by road traffic during night time below 45 dB Lnight, as night-time road traffic noise above this level is associated with adverse effects on sleep.

This study focuses on the night time noise levels, as these have the biggest impact on sleep and the resultant economic impacts. Additionally, as rental inspections are usually conducted during the day potential renters are less likely to consider the impacts of night time noise during an inspection.

The WHO recommendations are also based on an internal noise level, whereas the calculated road traffic noise impacts are calculated at the external façade. A common rule of thumb to correct an external noise level to an internal noise level is to subtract 10 dBA from the external noise level for noise passing through an open window (an activity common in Queensland). The argument as to whether that subsequent internal noise level should be based on a free field or façade correct level has been ignored here. Using the 45 dB Lnight guideline as a basis, this leads to an exterior façade noise level of 55 dBA Lnight.

5 RESULTS

The data were segmented into two groups, based on whether they were predicted to be above or below 55dB Lnight noise level at the most exposed façade on the property. Samples in the group with noise levels at or below 55dB Lnight had an average 5-yearly turnover rate of 2.4 turnovers. Samples in the group that exceeded the criteria had an average 5-yearly turnover rate of 3.5 turnovers. As such, in this small sample of properties in the Brisbane region, those with internal noise levels that are predicted to exceed the WHO guidelines for night time noise, experienced a rental turnover that was 69% higher over a 5 year period, compared to those with lower night time noise levels.

6 FUTURE WORK

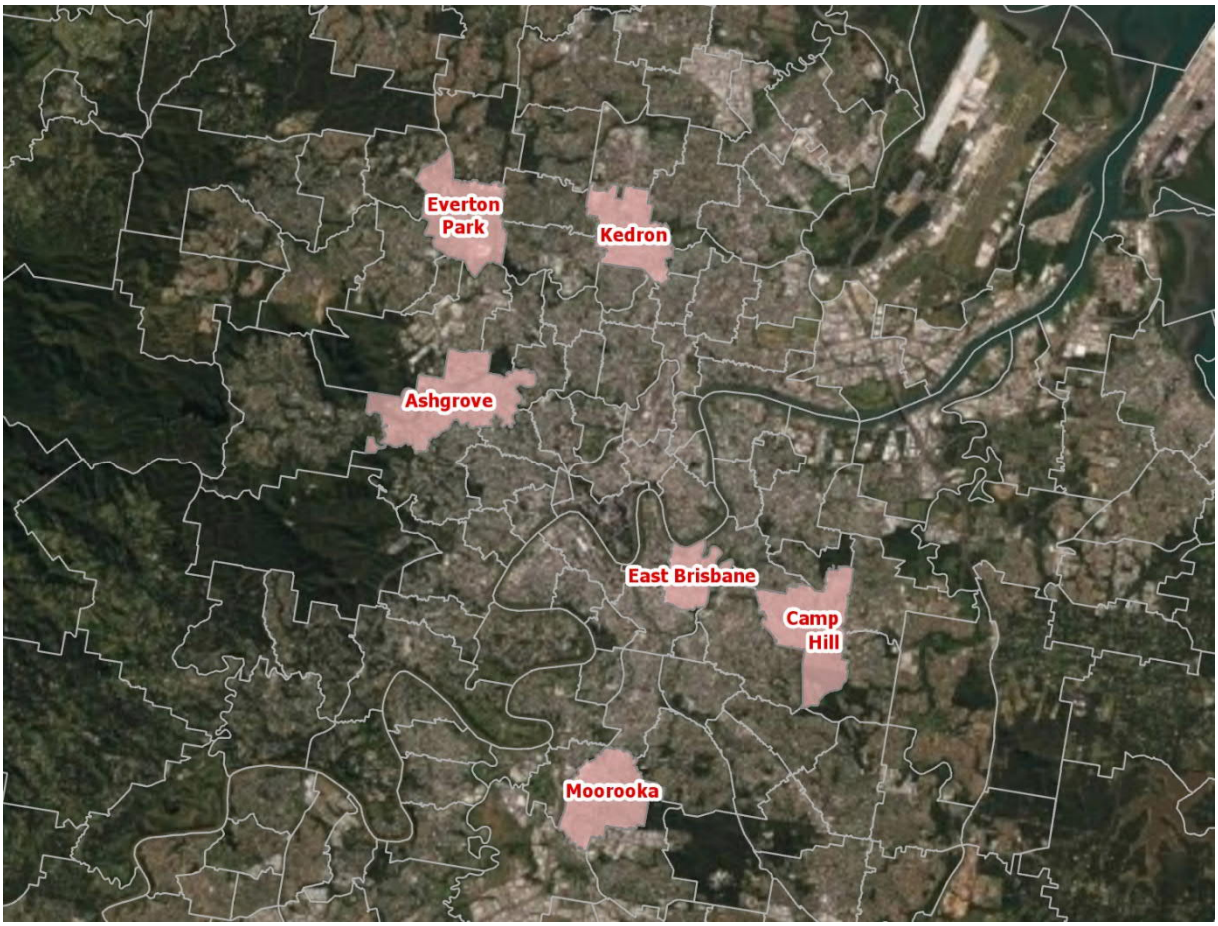
This study was performed on a very restricted sample due to the availability of data and the desire to compare properties that were as similar as possible, excluding the noise levels. Future studies should endeavour to increase the sample size used in the analysis, either by adding noise data for more similar suburbs, including apartments and/or the property value spectrum, or expanding the analysis to other cities.

The quality of the sample data should also be explored in future research. Rental data is notoriously inaccurate due to mis- or under-reporting, for example properties that are let off-market are not picked up in the CoreLogic data, and this could have a significant impact on the results. Future studies could instead look at the impact of noise on sales turnover, as the reporting of property sales data is mandatory. This means more accurate and comprehensive datasets are available, including records of sale dates and prices.

Future research could investigate the impact of a number of variables that were intentionally removed from this study, including:

- whether the rental turnover due to noise varies depending on property size
- apartment versus house turnover due to noise
- property age, building construction and whether the property has air conditioning.

It is noted that no analysis of noise treatments at the individual properties was conducted. Further studies should investigate this aspect and analyse whether applying noise treatments to dwellings has an impact on reduced rental turnover. This could present a compelling incentive for landlords to install noise treatments for their tenants, or for future landlords to consider the transport noise level at prospective properties.



Source (ESRI, 2019)
Figure 1: Brisbane suburbs considered within the study

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