

Opinion versus Reality: Flood-affected property values in Rockhampton, Australia

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Abstract:

The 2011 Rockhampton floods are taken as a case study to examine resident opinions compared to market realities of the impact of flooding on property values. A mail survey of flood-affected properties returned a sample of 111 respondents' views on various aspects of the flood experience and impact. It was found that over 50% of respondents believed the flood event had a negative impact on property values of whom the majority believed the impact was a large decrease in values.

Survey results were compared to the actual performance of the market which failed to show any defensible impact attributable to the flood event. The literature reveals equivocal findings impacted by various factors. In the subject case it appears that the level and type of media coverage may have been responsible for the creation of opinions at variance with reality.

Keywords:

Flood hazard, disaster economics, Rockhampton floods, Fitzroy River, property value, rational economic behaviour, efficient markets

Introduction

Property values are based on the bidding process and demand, which are driven by more, or less, attractive property characteristics (Debrezion, Pels and Rietveld, 2007). These characteristics consist of location, as well as, physical and accessibility characteristics (Bowes and Ihlanfeldt 2001). Implicit in this view of property market behaviour is the assumption that the values of attractive property characteristics are efficiently and rationally incorporated into property prices. However, housing markets have been found to not be fully efficient as Chernobai, Reibel and Carney found in their investigation into the incorporation into sales prices of information regarding an impending new highway extension construction (Chernobai, Reibel and Carney, 2011). Nonetheless, economists suggest that housing markets are rational because there is evidence that property values are sensitive to real or perceived risks associated with the cost of a hazardous incident such as a flood (Farber 1998). This study is a test of information efficiency between the opinions held in the community and their impact on property prices.

Floods dominate the extreme natural hazardous events that have occurred through the world during the first decade of the twenty first century. Floods occurred in Africa (2000, 2006, 2007, 2008, 2009), Australia (2007, 2010-11), Brazil (2011), China (2007), Europe (2002), India (2005, 2008, 2009, 2012), Taiwan and Philippines (2009) and USA (2005, 2006, 2010). As a consequence of these floods, people have been killed, injured, affected economically, psychologically stressed and/or physically displaced and also floods have brought about demographic changes in neighbourhoods and political conflict within communities (Lindell & Prater, 2003; Ziao, Wan and Hewings, 2011). It has been estimated that, 'property damage has been doubling about every seven years over the past 40 years' (ICSU, n.d:1). However, despite prolific media reporting in recent years stimulating an international preoccupation with the impact of floods on people and property, there are contradictory opinions about the specific effect of floods upon property values.

The 2010-11 Rockhampton floods fitted the definition of a disaster because of their visible extent within one of the more important Australian regional centres and their impact on the lives of those affected (Guha-Sapir, Hargitt and Hoyois 2004). Flooding at Rockhampton is gentle with inundation being more in the form of flood water storage than a damaging high velocity torrent. The floods are forecast with a very reliable 10-14 day advance warning system and relatively few properties experience flooding above floor level. Most properties are highly flood-ready and occupants are generally able to prepare for the floods without great difficulty. Despite the floods covering the roads and yards, in the past many residents have elected to sit through former floods and simply wade in and out of their properties as necessary. The 2011 flood saw the greatest inconvenience being the local council's decision to switch off power, thus forcing evacuation on the grounds that it would result in a higher level of overall safety.

In this environment, flood costs were not very important in absolute economic terms but, since the event overwhelmed local capacity and necessitated requests to the national level for external assistance, the print and electronic media described the event as a disaster. The implementation of emergency relief and short-term life-saving actions were required, despite the importance of pre-emptive flood planning having been widely recognised throughout the Central Queensland region (Guha-Sapir, Hargitt and Hoyois, 2004). At the time of the Rockhampton flood, there was a relative dearth of newsworthy events in Australia and the event was given extensive media coverage. The circumstances of the Rockhampton floods

should not be confused with that of other Queensland floods and cyclone damage in early 2011. Many of these involved considerably greater and unexpected material damage and human costs.

The contrasts between the Rockhampton floods and other national disasters points to the importance of nuancing the popular understanding of flooding, especially amongst people who live well away from flood prone localities. Bi and Parton (2009) proposed that one means of making a contribution to understanding the disaster significance of flood events in rural and regional Australia is to conduct regional case studies. This study examining flood-plain dwellers' perceptions of the 2010-11 Fitzroy River flooding is intended, therefore, to contribute to the body of Central Queensland flood disaster research. The findings of this study were gathered from a sample of one hundred and eleven self-volunteer flood-plain dwellers survey participants, representing a sample of about 15% of the flood affected properties in the study area. The survey was directed to the heads of flood-affected households and hence it represents the views of persons most likely to be influential in major household decisions. As such it represents a valid sample of household inclination more than of individuals.

Literature Review

There is a paucity of recent Australian flood disaster studies reported in the literature but within this literature the focus of attention has been given to the hydrology and the geomorphology associated with flooding rather than on problems of social importance. However, a review of the literature indicated that a wider range of flood studies have been conducted in other parts of the world, with quite a few being carried out in the United States of America. The prevalence of USA studies may be explained by the opinions that 'floods are the most costly and common natural disaster in the United States' (Zhang, 2010:118) and that 'annually, flooding causes more property damage in the United States than any other type of natural disaster' (Bartošová, Clark, Novotny and Taylor, 1999:1). Although variables affecting findings of other studies may limit the pertinence of these findings to the Rockhampton floods, nonetheless, these earlier studies may provide some support for the findings of the 2010-2011 Rockhampton flood study.

A preponderance of the studies investigating the effect of flood on property values has concluded that flooding significantly reduces property values: however, there are variations

in the estimated amounts the reduction. Donnelly (1989) found that the reduction in value was just over 12%. Dei-Tutu (2002) found that although the capitalized insurance premium value represents approximately 4 percent of the house's selling price, property values were discounted by 6.6% for houses located in a floodplain. Bin et al. (2008) concluded that the differential amount was 11%. Schultz and Frigden (2001:595) found that 'being located in the 100-year floodplain lowered the home values by \$8,990, and such homes were worth \$10,241 less than similar homes located outside the floodplain before the major flood event of 1997'. Two property value studies, one in Florida (Harrison, Smersh and Schwartz, 2001) and one in Australia (Eves, 2002), arrived at similar conclusions: flood-labile property has less value when compared with similar flood-free property. Harrison, Smersh and Schwartz (2001) concluded that the relative importance of flood zone location appeared to be increasing over time, particularly since the inception of the National Flood Insurance Program (NFIP). Also, there is support for the conclusion that flooding has a negative effect on property value coming from Special Flood Hazard Area (SFHA) research in non-coastal areas of America; this study concluded that the value of a property was reduced by about 8.6% (Posey and Rogers, 2010). According to floodplain residents in Ontario, location and site characteristics were the most important characteristics in determining the value of a home (Shrubsole and Scherer, 1996).

However, while these studies confirm the intuitive expectation that flooding impacts on property values, other studies suggest that the assumption that floodplain location alone is a sufficient basis for adjustments to property values is unwarranted. An analysis of sale prices of floodplain properties in Homewood, Alabama, found that there was no evidence that merited appraisers adjusting values for floodplain location (Bialaszewski and Newsome 1990). Smith (1994:231), also, has commented that 'there is a relatively poor relationship between the market price and susceptibility to flood damage'. This conclusion was sustained by Skantz and Strickland (1996:75) who found that the prices of homes in the sample did not fall immediately after the flood and did not rise later but 'when flood insurance premiums rise dramatically approximately one year after the flood, these higher rates are capitalized into home values and prices do decline'. Also contrary to conventional wisdom that prices are impacted negatively by flood risk, Bin and Kruse (2006) established that properties in an area designated as a Special Flood Hazard Area (SFHA) were valued at 10% greater than comparable properties outside of the flood zone. The explanation offered for these counter-

intuitive results was that there is a correlation between risk and amenity value associated with coastal settings, with the amenity value effect having a greater weight than the flood effect. Flood plains and coastal areas are vulnerable to flood but they open up recreational opportunities and aesthetics associated with rivers and coastlines (Zhang 2010). Prior research, indicating that willingness to pay for a view amenity is high, supports the suggestion that amenities have a greater weighting than flood dis-amenity (Benson, Hansen, Schwartz, and Smersh, 1998).

One explanation for the inconsistency of flood effects on property values may be found in studies examining risk perception. According to research underpinned by behaviour theories, risk perception is affected by both currency and intensity of the hazard, along with frequency of experience with hazard occurrences (Lindell and Prater, 2000). Understanding the level of threat from environmental hazards is related to length of tenure in an area (Zhang, 2010) and by proximity to hazard sources (Lindell, Lu, and Prater, 2005; Peacock, 2003), while hazard experience mediates risk perception and hazard source (Lindell and Hwang, 2008). Buyers' demographic characteristics (gender and ethnicity) have also been noticed to influence the perception of flood effects (Fothergill and Peek, 2004; Fothergill, Maestas and Darlington, 1999; Fothergill 1999, 1996). Variation in property price differences in flood areas from year to year observed by Eves (2002) was not a constant percentage, also suggesting that variables affecting risk perception may need to be taken into account in discussing property values.

Another variable playing an important part in influencing demand and ultimately property prices has been reported to be the dissemination of flood information. Flood data availability and the dissemination of accurate and reliable information vary. A 19% decline in property values was attributed to providing new information about environmental risk to buyers by Hallstrom and Smith (2005) whereas Pope (2008) credited a 4% decline in housing prices in flood zones to the commencement of seller disclosures for flood zones. Small, Newby, et al. (2012) found that remote decision makers responsible for providing debt finance and insurance appeared to have the dominant impact on demand following flood events through the mediating influence of the media.

In Australia, floods are a state government legislative responsibility, with the Federal Government playing a minor role in managing Australia's flood risk. State governments have devolved their responsibility to local councils who have no uniform approach although each

local government area in Queensland produces flood maps indicating the land subject to flood classifications (Eves, Blake and Bryant, 2010). It is difficult in Australia to insure a property for flood damage and finance is generally not available to residential properties where the building floor level is below the 1 in 100 year flood level identified by the Local Government Authority' (Eves, Blake and Bryant, 2010:5). In the USA, since the introduction of the Federal Emergency Management Administration to oversee the Disaster Mitigation Act (2000), the Flood Disaster Protection Act (1973), and the National Flood Insurance Act (1968) which established the National Flood Insurance Program (NFIP) and the National Flood Insurance Reform Act (1994), the purchase of flood insurance is mandatory for houses in one-hundred year flood zones when home purchases are financed by federally regulated institutions; mortgage lenders are required to determine the flood zones according to FEMA flood maps for any homes that they mortgage (Burby 2006). One study has suggested that 'local flood regulations often have a greater effect on value than the actual threat from potential flooding' (Owen and Roberts, 1991:194). This opinion was supported by the conclusion of Holway and Burby (1990) that it was floodplain elevation requirements that affected the value of vacant land located in flood hazard areas. Since a property's possible flood liability has implications in relation to property finance and property insurance, the availability and dissemination of flood information is also likely to affect property values.

Method

Properties affected during the 2010-11 Fitzroy River floods in the Rockhampton suburbs of Depot Hill and Park Avenue were identified from the Rockhampton City Council maps and 500 surveys were distributed to these properties, or in excess of two thirds of flood-affected households in the selected suburbs. The survey consisted of a letter of introduction explaining the purpose of the survey and an invitation to the head of the household to complete the attached questionnaire and return it in the pre-paid return-addressed envelope within seven days.

The questionnaire was devised to collect data on perceptions of flood effects from flood-affected residents of two Rockhampton suburbs. Householders were asked a series of multiple choice questions relating to flood magnitude and its effect on their lives in order to explore their perception of the flood hazard. The extent of the respondents' mental adjustment to the perceived flood risk was assessed by asking how long they had lived in the

area and whether or not they had considered moving to another area. Information concerning the nature of adjustments made by householders was sought by multiple choice questions and also by allowing space for respondents to provide additional information.

Data were analysed using descriptive statistics such as simple percentages and summary tables. The Australian Bureau of Statistics 2011 Census data (available at http://www.censusdata.abs.gov.au/census_services/getproduct/census/2011/quicksts/) was used to assess whether there was an age bias among survey respondents. Householders' perceptions of the effect of floods on property values evidenced in the data were compared with median sale prices for property sales for 2010, 2011 and 2012 available through rpdata.com.

Results

The results outlined in this paper are for a single region in Australia, the Fitzroy River floodplain area of Rockhampton in Central Queensland. Discussion will be limited to two of the flood prone urban areas of Rockhampton. The census data for Depot Hill, Park Ave, and Rockhampton, indicated that the over 65 age group contained the largest number of people and the survey category with the largest number of respondents (41 = 39%) also falling in the over 65 age group. The number of people in each age category over 25 years of age reported in the census data for Depot Hill, Park Ave and Rockhampton was similar, but this distribution was not followed by the proportion in each of these survey categories since there was a linear decline between the number of survey respondents and the younger age categories.

Table 1: Number of people in each age category

Age (Years)	Depot Hill	Park Ave	Relative percentage	Rockhampton	Survey respondents	%
18-25	*	*		*	4	4%
26-35	127	772	21%	8,144	9	8%
36-45	129	621	18%	7,629	11	10%
46-55	138	621	18%	7,935	17	16%
56-65	125	608	17%	6,346	24	23%
Over 65	163	925	26%	8,536	41	39%

Source: http://www.censusdata.abs.gov.au/census_services/getproduct/census/2011/quicksts/ and survey results

*This specific category was not reported in the census data.

In response to the question about whether respondents thought that house prices changed in their flood-affected locality after the flood only approximately a quarter of the respondents were of the opinion that there was ‘no change/a small change’ in house prices. More than half the respondents were of the opinion that there had been a decrease in prices, although 22% of respondents did not know what was happening to house prices.

Table 2: Respondents opinions about property values (Question 13)

	Owners	%	Renters	%	Total	%
Large decrease	31	35	1	6	32	30
Small decrease	21	24	3	17	24	22
No change	18	20	8	45	26	25
Small increase	1	1	0	0	1	1
Large increase	0	0	0	0	0	0
Don't know	17	19	6	33	23	22
Total	88		18		106	

Source: Devised from survey responses

Question 20 in the survey asked respondents for their opinion about whether a house in this locality is cheaper now because of the flood risk. Data for responses to question 20 are reported in Table 3.

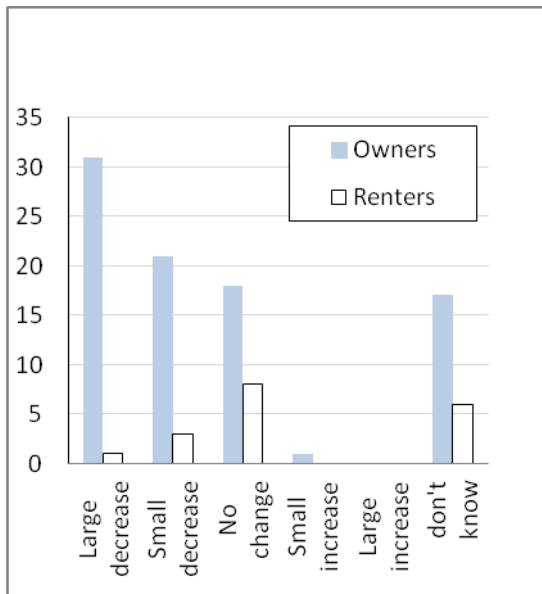
Table 3: Cheaper houses because of flood risk (Question 20)

	Owners	%	Renters	%	Total	%
Cheaper	47	53	4	22	51	48
Not Cheaper	25	28	8	44	33	31
Unsure	16	18	6	33	22	20
Total	88		18		106	

Source: Devised from survey responses

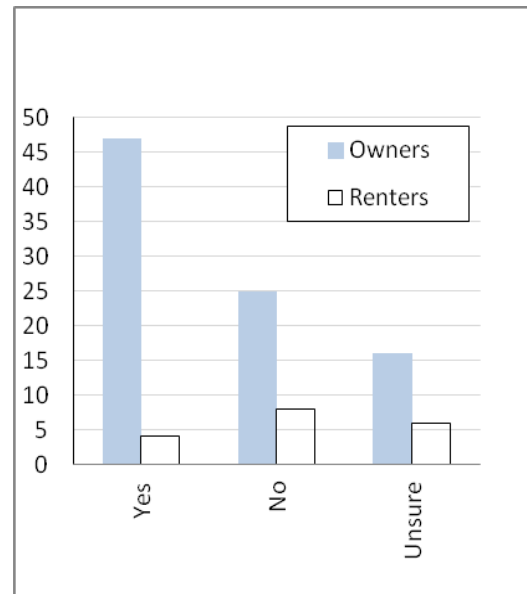
In order to check survey response reliability, another question, question 20 which was designed to elicit the same information as question 13, asking respondents' opinion about property values after the flood, was placed further through the survey but phrased differently from question 13. The distribution of responses to question 13 in each category of Owner and Renter survey respondents is shown in Figure 1 while the distribution of responses to question 20 in each category of Owner and Renter survey respondents is shown in Figure 2. A comparison of the two graphs shows that the distribution was sufficiently similar in the responses to both questions about property values following the flood to deem that the responses reflected good consistency.

Figure 1: Property values following the flood



Source: Devised from survey responses

Figure 2: Cheaper houses due to flood risk



Source: Devised from survey response

RPData.com indicates that the Rockhampton median sales figures for the years 2010, 2011 and 2012 have progressively fallen from \$281,750 through \$277,000 to \$275,000, a trend for house prices also found throughout most parts of Australia generally and considered to be indicative of the state of the global financial market. The Rockhampton prices, however, vary somewhat from the median sales prices for Depot Hill and Park Ave, the two suburbs of Rockhampton wholly and in part affected by the December 2010/January 2011 Fitzroy River flooding. In the year prior to the flood, 2010, there was a marginal drop in the median house

sale price in Depot Hill from \$180,000 in 2009 to \$179,000, or about half a percent. In 2011 the median house sale price dropped 11% to \$160,000, suggesting a 10% greater fall than the trend of the previous year. Small, Newby, et al., 2012 compared the performance of Depot Hill to the comparable flood free Rockhampton suburb of Wandal and concluded that this apparent post-flood fall can also be interpreted as a continuation of the relative fall in attractiveness of Depot Hill compared to elsewhere in Rockhampton that had begun from a peak in relative attractiveness in 2008. In 2012 the median house sales price has rebounded upward to \$170,000, about equal to its 2006 level. However, the Park Ave median house sale prices have followed the pattern in neither the median house sales prices for Rockhampton or Depot Hill. They increased from a low of 3% from 2009 to 2010 and a further 3% in 2011, ahead of Rockhampton as a whole that grew by +2% and -2% in the same two periods as listed in Table 4.

Table 4: Median sale prices and number of sales for Depot Hill, Park Ave and Rockhampton

	Depot Hill Median Sales	Depot Hill Number of Sales	Park Ave Median Sales	Park Ave Number of Sales	Rockhampton Median Sales	Rockhampton Number of Sales
2012	\$170,000	12	\$250,000	57	\$275,000	477
2011	\$160,000	15	\$260,000	77	\$277,000	751
2010	\$179,000	18	\$252,000	87	\$281,750	704
2009	\$180,000	26	\$245,125	142	\$275,000	1052

Source: rpdata.com, viewed: 29/8/2012

The depth of the respective markets is an important impediment in the analysis. Depot Hill saw only 15 sales in the year following the flood, only marginally more than one per month. With such a thin market it is impractical to attribute trends with great precision. Park Avenue with about five times the frequency of sales may be the more robust indicator. Small, Newby and Clarkson (2012) reported that Rockhampton property professionals were of the opinion that sales had been slowed in Depot Hill due to the decisions of financiers and insurers who were apparently adversely influenced by the national media coverage.

Depot Hill become well known nationally as the centre of flooding problems in Rockhampton, though the Park Avenue locality, which was also heavily affected by flood

waters, did not attract media attention. This difference in media attention was apparently due to its geographical shape. Depot Hill is a compact sizeable area, close to the CDB. Aerial photographs focusing on Depot Hill in the foreground, but with extensive flood waters into the background have considerable visual impact, even though the flooding is not actually very deep about the houses. By contrast, the Park Avenue locality is a narrow strip of river frontage that does not extent more than a block or two back from the river with a large expanse of absolutely flood free Rockhampton residential development behind it. That is, aerial photos of Depot Hill create the impression of a flooded town amongst a flooded landscape, while aerial photos of Park Avenue communicate the reality that the flooding there represents a slim strip of inundation between the majority of the city and the river. To keep national media interest in flooded Rockhampton, it is easy to see why news coverage preferred Depot Hill over Park Avenue, despite both having comparable relative levels of inundation.

Thus educated by national media, it is understandable that financiers and insurers may have become tardy at accepting proposals involving investment in Depot Hill, despite protestations from local property professionals. This blight did not extend to Park Avenue due to its invisibility on national media. In relative terms the sales volumes in Depot Hill and Park Avenue did not reflect this 'media effect' though it may have had some bearing on the 6% fall in Depot Hill prices during 2011 despite Park Avenue experiencing a 3% rise during the same period. Care should be taken not to read too much into the significance of these annual changes because as they are based on a small numbers of sales.

Discussion

Differences from the census in the number of survey respondents in the various age groups for the suburbs of Depot Hill and Park Ave could have a number of explanations. Not only did the limitations imposed by CQU Ethics Committee on the age of survey participants (no people under 18 years of age) make it difficult to determine from the Australian Bureau of Statistics (ABS) 2011 census data whether there was a proportional bias in each age group of survey respondents, but the design of the survey inviting the head of the household to complete the survey predisposed a bias in the older age categories of respondents. The ABS census data for the Depot Hill, Park Ave and Rockhampton populations separated people between the ages of 20-24 years and 15-19 into two different categories while people below

the age of 15 were included in other categories; these were different age categories from the survey categories and, consequently, the percentages of people reported in the census for each of the age categories did not allow percentage comparisons between the census data and survey data. Since it is likely that as people age they may have fewer societal and family responsibilities they may have more time to engage in voluntary-participation surveys and this may have introduced an age bias in the respondents. However, another explanation for an age bias in the respondents may derive from the letter of introduction's invitation to the head of the household (rather than younger household members) to undertake completion of the survey. Furthermore, the decision for more people who were older to participate in the survey may have been biased by the length of time people have lived in the flood affected areas; 67 (63%) of the 106 respondents had lived in the flood areas for more than 10 years. Other research, Zhang (2010), indicates that length of tenure in an area is related to people's understanding the level of threat from environmental hazards and this greater understanding may have motivated people to participate in the survey. This suggestion is supported by the smaller numbers of survey participants falling into the shorter tenure categories: between 5-10 years - 18 (17%); 1-5 years - 17 (16%); less than 1 year - 4 (3.8%). However, although it is acknowledged that there is an age bias among the 111 survey participants, nonetheless, the respondent profile is not inconsistent with the expectations of heads of households.

The objective behaviour of the markets does not throw convincing support on the view that the Rockhampton floods caused falls in the market for flood affected property. The evidence from Depot Hill suggests that the apparent price fall in 2011 could easily be the result from a fall in popularity in the suburb that began from the peak in 2008 which made the apparent stability of 2010 more illusory than robustly defensible. The behaviour of Park Avenue is counter intuitive on the basis of flooding, though it resonates with that part of the literature that recognises the positive attributes of property adjacent water courses. When this is combined with the depth of the Depot Hill market post-flood, the only conclusion that can be made from this data is that there is no positive evidence that values fell significantly in the year following the floods *as a result of the floods* in the localities investigated.

The opinion of the 30% of respondents who believed that property values suffered a large decrease due to the floods is therefore not supported in the data. Likewise, the 23% who were of the more modest opinion that the floods resulted in a *small* decrease in values were similarly at variance with the realities. Likewise, the strength of the negative opinion,

representing as it did about 50% of the respondents, does not seem to be supported by historical behaviours or flood costs (Small, Newby, et al. 2012), leading to the conclusion that those most impacted by the practicalities of flooding hold opinions not grounded in a rational appraisal of the realities.

Conclusion

Since much of the town of Rockhampton was not affected by flooding of the Fitzroy River in 2011, the downward change in Rockhampton median sales prices from 2010, through 2011 to 2012 indicate that flood risk is not the primary variable affecting property values. The Park Ave median sales prices increase in 2011, the year immediately following the flood, also supports this conclusion.

The study has found that there is a major dislocation between local opinion amongst flood-affected property occupants and the market realities. Since the respondent group represented the heads of households in the area, and therefore the major decision makers, this gap between opinion and reality has several important implications. Firstly, it throws doubt on the assumption at the heart of economic theory that market agents are well informed and rational. Secondly, it leaves the behaviour of the market itself unexplained, since a sample of people who could be expected to be representative of market participants appear to attribute value estimates to the locality at variance to those found in the actual transactions. Lastly, it leaves open the question of how exactly the opinions have been formed.

While the first two issues point to fundamental problems with commonly held assumptions within economic and property valuation theory, the third points to wider social issues. A quarter of the respondents to the survey were of the apparently correct opinion that there was no change in prices. This belief may have been the result of sober appraisal of such things as the longer term behaviour of prices in the area or of the behaviour of rents (which also showed no positive indication of reduction). Australia was short on domestic news in January 2011 and floods make spectacular television images. The media coverage of the Rockhampton floods was extensive and included breakfast programme hosts transmitting from row boats anchored along inundated streets. A sober appraisal of the Rockhampton floods as low cost, low hazard, forewarned creeping inundation would be hardly newsworthy, and certainly not sufficient to hold the attention of urban audiences for the two weeks or so that they were the event of interest in Australia. It is hardly surprising that the results of the

media coverage have been effective in creating opinions that are at marked variance with reality.

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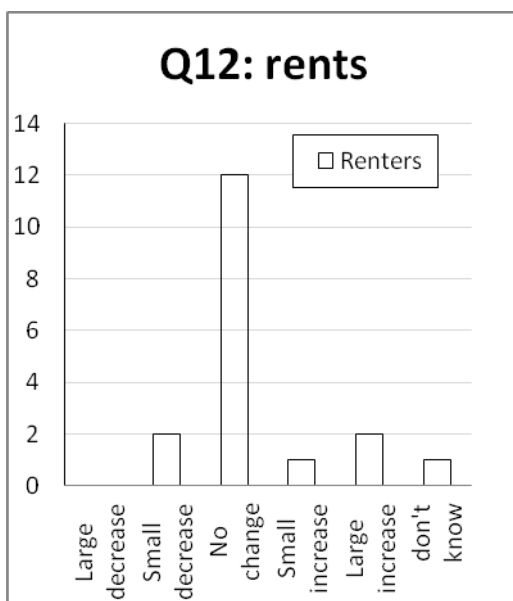
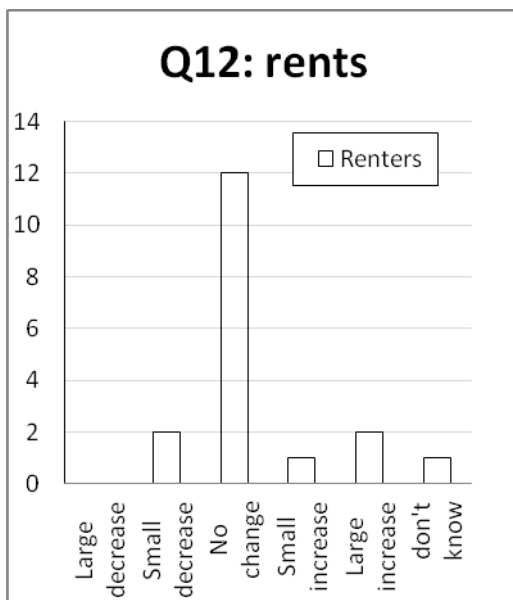
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Stigma – eg power lines are cast as a negative externality or a necessary evil (Elliott and Wadley 2002)

- 1) If you are renting, did you experience any change in rents after the floods?
 - a. Large Decrease
 - b. Small Decrease
 - c. No change
 - d. Small increase
 - e. Large increase



Do people moving into this area now expect to pay lower rents than before the floods?
Yes/No

