International Journal of Housing Markets and Analysis
Leaky building stigma: can it be eliminated by remediation? Evidence from New Zealand
Song Shi, Iona McCarthy, Uyen Mai,

Article information:

For Authors

If you would like to write for this, or any other Emerald publication, then please use our Emerald for Authors service information about how to choose which publication to write for and submission guidelines are available for all. Please visit www.emeraldinsight.com/authors for more information.

About Emerald www.emeraldinsight.com

Emerald is a global publisher linking research and practice to the benefit of society. The company manages a portfolio of more than 290 journals and over 2,350 books and book series volumes, as well as providing an extensive range of online products and additional customer resources and services.

Emerald is both COUNTER 4 and TRANSFER compliant. The organization is a partner of the Committee on Publication Ethics (COPE) and also works with Portico and the LOCKSS initiative for digital archive preservation.

*Related content and download information correct at time of download.

Leaky building stigma: can it be eliminated by remediation? Evidence from New Zealand

Introduction

During the 1990s, monolithic cladding became popular in new home construction. Types of monolithic cladding include the Exterior Insulation and Finish System (EIFS), texture coated fibre cement and stucco. The Building Research Association of New Zealand ("BRANZ") has defined monolithic cladding as "cladding with the appearance of unbroken wall surface like traditional plastered masonry" (BRANZ, Seminar Series, 2001). Problems with homes using monolithic cladding are their high risk of being leaky buildings. The Hunn Report (2002) identified complex and systematic failures within parts of the New Zealand building industry where the use of monolithic cladding contributed to the widespread building failure which is known as "leaky home syndrome". The damage is substantial. PricewaterhouseCoopers (2009) estimated the total number of affected dwellings could be within the range of 22,000 to 89,000. Based on the consensus forecast of 42,000, which represents approximately 10% of total dwellings built between 1992 and 2008, the repairs and replacement cost of affected leaky homes were estimated at approximately NZ$11.3 billion (in 2008 dollars) or about US$8.1 billion.[1]

Monolithic clad dwellings were often confused with those clad in traditional stucco which was similar in appearance. However, traditional stucco cladding takes water penetration into consideration and incorporates the use of building paper or other flashing materials behind the wall surface to carry water down and out of the bottom of the wall. Monolithic cladding relies on face sealing. It was assumed that moisture would not

---

[1] In 2008, 1 New Zealand dollar was on average equivalent to 0.7145 US dollar.

penetrate beyond the monolithic cladding to the substructure. Many monolithic clad buildings are now reported to have leaked. Once water penetrates the exterior of a monolithic clad structure, any untreated framing timber can rapidly rot. This can endanger the structural integrity of the building. In addition, toxic mould may grow in this damp environment, leading to potential health problems as well as impacting on property values (Simons and Throupe, 2005). Figure 1 shows typical defect of monolithic clad homes and full cladding replacement from "monolithic look" to "traditional look".

<Insert Figure 1 about here>

Stigma is a risk perception arising from uncertainty regarding future events which are influenced by social and cultural context (Slovic, 1987; Gregory and Satterfield, 2002). In line with the lemon theory proposed by Akerlof (1970), concern about the weathertightness of monolithic clad buildings has resulted in stigma.[2] Normally, there are several ways in which stigma manifests: for example "general market stigma" and "residual stigma".[3] General market stigma refers to a stigma induced by a problem that does not physically affect the property in question. For example, environmental contamination could cause general market stigma price discounting of the values of properties which are proximate to the source of contamination, but which are not in fact contaminated. Kiel and McClain (1996) found that house prices in a market surrounding a proposed incinerator rebounded after the plan was cancelled. Residual stigma on the other hand is a post remediation stigma where properties containing known defects have been repaired. Compared to general

---

[2] The lemon theory is described in financial literature. The problem was first discussed by the economist George Akerlof in terms of information asymmetry between buyers and sellers of second hand cars. George Akerlof was a Nobel Prize winner for research related to asymmetric information.

[3] General market stigma is sometimes called proximity stigma. In this paper it refers to the risk perception and associated price discounts to all monolithic clad dwellings whether or not they have leaked. Depending on timing of discovery of the problem, direct stigma damages to property can also be classified into pre-, during and post-remediation stigma (see Simons (2006) p51 for more discussion on types of stigma).

2

market stigma, residual stigma is a direct stigma that contributes to a loss in value of an affected property in addition to repair costs. The legal implication of differentiating the above two types of stigma is that general market stigma is seldom supported in court for compensation but the claim of residual stigma is normally allowed (Muldowney and Harrison, 1995).[4] Normally, when a property is affected by a problem giving rise to a residual stigma the traditional remedy of repair costs will not compensate adequately due to a residual diminution in the market value of the property even after the remediation is carried out. However it is unclear if post remediation stigma is additional to general market stigma, if any. Given the importance of understanding that stigma can persist even after experts determine that no risk exists (Schulze and Wansink, 2012), empirical evidence of actual property value changes due to remediation will have direct implication for stigma assessments.

In this research, a questionnaire survey of property professionals has shown that both general market and post remediation stigma exist for "monolithic look" buildings constructed in the 1990s and 2000s. The property valuation/sale price discount due to stigma damages is significant. On average there is an 11% discount for general market stigma and an additional 5 to 10% for post remediation stigma depending on the severity of the leaking problems. As many modern homes have been constructed in this cost effective manner, the findings in this research provide an understanding of the severity of stigma damages on property values. Monolithic stigma devaluation does exist in the minds of property professionals, especially valuers. This is of importance not only to homeowners,

---

[4] The legal implication could be very different and complex from country to country. In USA, some States allow for proximity stigma and others do not. However, most US courts will allow claims for direct stigma damages to property. For claims due to direct stigma damages there must be a permanent or long term diminution in property value after remediation. This is the case in New Zealand.

but also to the property industry and appropriate government agencies. Moreover, this research has contributed to the literature and provides empirical evidence that post remediation stigma can be in addition to general market stigma, based on the lemon theory proposed by Akerlof (1970).

The next section reviews the literature covering the issue of stigma followed by the discussion of theoretical framework, empirical data and results. The final section concludes.

JEL classification: R30

Keywords: leaky building syndrome, leaky building, stigma

Economic literature and stigma

The economic implications of stigma on property value have been documented in real estate literature. From an economic viewpoint, the stigma associated with affected properties arises from concerns about quality and uncertainty. Sellers have knowledge of their own property and its weathertightness history from personal experience; this information is not available to a potential buyer. A potential buyer is most likely to rely on an inspection report commissioned from an independent expert. According to the lemon theory proposed by Akerlof (1970), the asymmetrical information between sellers and buyers will have buyers considering the quality of all "monolithic look" properties to be uncertain. When a large number of buyers take the same view, a social norm may evolve to simply avoid those affected properties. As a result, not only will the market for trading defective properties deteriorate but the price of good quality "monolithic look" properties will also be discounted.

Post remediation stigma is generally defined in the property appraisal literature as the residual value loss in addition to the cost to cure the problem itself. In a study of contaminated properties Patchin (1988) observed that prices of contaminated properties were not fully restored, after they had been cleaned up, due to the perception of possible liability. In a later study, he further pointed out that stigma damages could be caused by a wide variety of both tangible and intangible factors such as fear of incomplete repair, ongoing monitoring cost and liability, and being unable to obtain financing (Patchin, 1991). One feature of stigma damage is that it relates to both real (tangible) and perceived (intangible) risks. The effect of real risk can be quantified with a high degree of confidence, while perceived risk is the risk seen by the public in the marketplace. It varies with the nature of cause, the source of risk, and the level of familiarity with the particular problem (Mundy, 1992a). Schulze and Wansink (2012) studied the behavioural economics of fear and stigma. They proposed a dual-process model of decision making to evaluate and determine the degree of stigma, where real risk can be determined by experts and perceived risk is a mix of consumers' proportional and dichotomous responses, both categories of which are influenced by social and cultural context. Wilson (1994) suggested that perceived risk was a function of factors including the level of confidence in remediation, the perception in the marketplace of regulatory standards, the availability of financing for defective properties, the strength of demand for the subject in the marketplace, and change in the market reaction over time to the presence of impairment. Syms (1995) further argued that stigma should involve all factors which are likely to have an impact on the value or price of land, rather than those which are readily quantifiable or those having reasonable estimates.

5

The extent to which remediation can restore value to a damaged property is debatable. However, there is no reason to suggest that stigma is attached to damaged properties only prior to the remediation. In fact it occurs both prior to and post remediation. This is because even after experts determine that no real risk exists, perceived risk by the public can still persist and may take a very long time for the affected property to regain its full, unimpaired value. Chalmers and Roehr (1993) set forth the concept of "contamination lifecycle". They postulate that uncertainty and risk are highest before remediation, then decline during remediation, and decline further after remediation and indemnification. A similar concept is illustrated by Bell (1997) in his four stages of recovery process for contaminated land. When contamination is understood and known by the public, the value of a property should increase to a point at which the difference between its market value and contaminated value is the sum of the cost to cure plus any residual stigma (Mundy, 1992b). Wiltshaw (1998) found remediation expenditure was associated with post remediation stigma which was generally lower than stigma prior to remediation.

Using a hedonic model Bond (2001) studied stigma damages in a case of a remediated contaminated site and a comparable clean site with no history of contamination. In her study the negative factors that caused the stigma damage prior to remediation include the cost to cure, remediation method, changes in legislation or remediation standards, difficulty in obtaining finance or a simple a fear of the unknown. Additionally, post remediation stigma was associated with ongoing insurance and monitoring costs. Overall, the study found that the presence of stigma arising from a site's contamination history has negatively influenced values of remediated properties.

6

Stigma is valued through the connection of property values and the presence of potential environmental and health hazards. Common techniques to identify and assess the economic impact of stigma on property value include multiple regression (Michaels and Smith, 1990; Kohlhase, 1991), sales comparison (Kinnard and Worzala, 1999; Wilson, 1994 & 1996), case studies (McClelland, Schultze and Hurd, 1990), income capitalisation (Mundy, 1992c; Patchin, 1988 & 1991), survey method (McLean and Mundy, 1998), and option/simulation pricing model (Lentz and Tse, 1995; Weber, 1997). Whilst most studies have focused on the impact of general market stigma on residential properties neighbouring the source of contamination, few studies have examined the economic impact of post remediation stigma on defective properties once the hazardous materials have been remedied or removed. This is mainly due to the scarcity of market transaction data on remediated properties and the complexity of the problem involved. As a result, the traditional hedonic regression analysis is not useful in the analysis of post remediation stigma. Arens (1997) extracted the stigma effect on property value directly from the marketplace through case studies of a contaminated site. He found that the residual loss in value was at 8% of unimpaired property value. Chalmers and Roehr (1993) utilized the contingent valuation method with surveys of knowledgeable market participants and Syms (1997) used the psychometric approach to estimate stigma effect.

Studies of stigma effect on leaky buildings are inconclusive. Kilpatrick, Brown and Rogers (1999) examined the effect of EIFS or synthetic stucco on property values in United States, Canada and Europe. They found that in order to value EIFS properties they must consider not only costs to cure but also increased future maintenance costs and the impact of stigma which can vary in different geographic markets. In contrast, Johnson and Salter

7

(2001) reported that the market was not discounting for EIFS clad homes, but the increase in marketing time for EIFS-clad homes was significant. Their study was focused on general market stigma for both sound and defective EIFS clad homes rather than post remediation stigma on remediated EIFS clad homes. Using hedonic pricing models with residential sales transaction data from the Auckland region between 1997 and 2006, Rehm (2009) studied the general market stigma for stucco clad houses. He found that the prices of stucco houses were generally 5-10% lower than "traditional look" houses. No analysis has been completed which compares the difference in prices between remediated stucco clad homes and those which have no history of leaking. Shi (2004) conducted a survey of property professionals in New Zealand. The results showed that the value loss between a remediated leaky home and home with no history of leaks is in excess of 13 percent in 2004 and stigma will not gradually diminish over time.

In summary, general market stigma has been widely researched and documented in the literature. In contrast there is a lack of research as to whether or not remediation will eliminate stigma, particularly in the presence of general market stigma. Some researchers believe that remediation will eliminate any residual value loss. Even if the remediated property value is below its full unimpaired market value, that could be due to the general market stigma which discounts all affected properties (Rehm, 2009). On the other hand, it is arguable that post remediation stigma can cause value loss in addition to general market stigma based on the lemon theory proposed by Akerlof (1970). Stigma is believed to be persistent over time. However, empirical evidence on time length of stigma is scarce.

Empirical Estimation Strategy

8

The intangible market factors

Many market factors are believed to have influenced the size and duration of stigma damages. This study used the Principal Component Analysis (PCA) method to compress those market factors into some main categories. The theoretical framework on cause of stigma damages in this study is based on the intangible factors outlined by Wilson (1994) and others, which includes level of remediation, regulatory standards, availability of finance, strength of market demand, and changes in the market reaction over time to the presence of impairment. These market factors are related to each other and stigma damage is a joint function of these market factors.

The PCA method allows us to determine whether those market factors can form a small number of uncorrelated variables which are easier to interpret and analyse. By investigating the pair wise correlation between variables, this method can determine which variables are suitable to combine with each other. Those related variables will be dealt with as a single variable with the lowest loss of information. The PCA method is used as the first step analysis in this study to reduce the number of predictors and avoid the problem of multicollinearity, particularly when the survey sample size is small. The method has been commonly used in the social sciences and market research, but also applied in property market studies. For example, Bourassa et al. (1999, 2003) used principal component analysis to extract factors from the characteristics of properties and neighbourhoods to form housing submarkets in a hedonic regression analysis. Öven and Pekdemir (2006) applied the same technique to analyse office market rent determinants for Istanbul, Turkey. Baroni, Barthélémy and Mokrane (2007) applied the PCA factor analysis in the study of apartment

9

sale prices index in Paris, France. For more information about the principal component analysis technique, please refer to Jolliffe (2002).

Price discount due to stigma

An Ordinary Least Squares (OLS) regression model is employed to examine the role of market factors and individual characteristics of respondents in influencing the effect of post remediation stigma on a property's sale price. The results will show if stigma damages will vary among respondents due to demographic factors. To be specific, the model is defined as

$$\Delta Price = \alpha + \sum_{i=1}^{k} \beta_i Dem_i + \sum_{j=1}^{p} \gamma_j ValCom_j + \varepsilon \tag{1}$$

Where $\Delta Price$ denotes the post remediation price change. Dem_i represents the respondent's demographic characteristics including occupation, experience, education and gender, and $ValCom_j$ is the respondent's PCA score for market factors. α is the constant and ε is the white noise. Respondent's occupation is coded from 1 to 5, representing other, real estate agent, property manager, building consultant, and valuer respectively. Experience is coded from 1 to 5, representing less than 5 years, between 5 and 10 years, between 10 and 15 years, between 15 and 20 years, and over 20 years, respectively; Education is coded from 1 to 4, representing high school, trade certificate or diploma, bachelor degree, and masters or higher degree respectively; Gender is a dummy variable, which equals 1 if the respondent is female and 0 otherwise.

10

The time length of stigma damages

This study applies a multinomial logit (MNL) regression to study people's responses on the persistence of stigma damages and respondent characteristics that may have influenced their choices. Under the MNL model, people's responses for the time length of stigma are assumed to depend on individual characteristics but not on attributes of their choices. The model is an extension of a standard logistic regression and is appropriate when the dependent variable is nominal and has more than two categories (Wooldridge, 2010). This is the case in this questionnaire survey, where time length has been divided into several timing groups which are from 0 to over 20 years. To be specific, the response probabilities of a MNL regression are

$$P(y = j|x) = \frac{\exp(x\beta_j)}{\left[1 + \sum_{i=1}^{J} \exp(x\beta_i)\right]}, \quad j = 1, \dots, J \tag{2}$$

where $P(y = j|x)$ is the jth response probability of timing groups and x is a $1 \times K$ vector (representing independent variables) with first-element unity. β_j is $K \times 1$ vector (representing the estimated coefficients for the jth response probability). Because the response probabilities must sum to unity, the base category probability when j equals to 0 is calculated as

$$P(y = 0|x) = \frac{1}{\left[1 + \sum_{i=1}^{J} \exp(x\beta_i)\right]}, \quad j = 1, \dots, J \tag{3}$$

The following equation is used to estimate $x\beta_j$

$$Time = \beta_0 + \sum_{i=1}^{k} \beta_i Dem_i + \varepsilon \tag{4}$$

11

where $Time$ is time length status/category, and Dem_i represents the demographic characteristics of respondents which are defined in equation (1). ε is the white noise.

The study tests the following hypotheses/objectives:

H1. Stigma is a joint function of the intangible market factors and the PCA analysis should reveal the main factors causing stigma damages.

H2. Stigma damages, if any, are caused by market factors and must be robust to individual characteristics of the respondent. Thus, the demographic coefficients $\sum_{i=1}^{k} \beta_i Dem_i$ in Equation (1) will be statistically insignificant; in the meantime the market factor coefficients $\sum_{j=1}^{p} \gamma_j ValCom_j$ will be significant.

H3. The demographic coefficients $\sum_{i=1}^{k} \beta_i Dem_i$ in Equation (4) will be statistically insignificant, if the time length of stigma damages is robust to individual characteristics.

Survey and sample

Property transaction data for remediated leaky homes are limited and not well recorded in New Zealand. Thus it is very difficult or even impossible to identify those remediated properties in a standard property transaction dataset. Moreover, a vast amount of information regarding the nature of property defects, remediation process and method are very difficult to obtain. For these reasons, post remediation stigma is often studied or reported on a case by case basis.

In this study members of the Property Institute of New Zealand (PINZ) and the Real Estate Institute of New Zealand (REINZ) were invited to participate in an online website

survey during April and May 2015. The members of PINZ are mainly property valuers (appraisers), building consultants and property managers, while the members of REINZ are mainly real estate agents. The same online survey was used for both the PINZ and REINZ members. Members of PINZ have professional knowledge to assess stigma and members of REINZ have market knowledge of stigma damages.

The survey instrument was first tested among a small group of property professionals before being distributed. An invitation for participation in the survey was emailed to members in the organisations' weekly newsletters, followed by two reminders four weeks and eight weeks later. Participants were directed to the survey webpage where more detailed information including a survey cover letter and instructions were given. Participants then continued their survey by answering questions and submitting them online. In total, 114 completed responses were received. At the time the survey was conducted there were approximately 6,000 residential members of the REINZ and 500 residential property valuers. The response rates are calculated at approximately 1% for REINZ and 10% for PINZ members, assuming all members have read the emailed weekly newsletter and found the invitation for the web survey contained in the newsletter.[5] The low response rates are in line with the nature of the survey topic as not many people have the experience or required knowledge regarding stigma damages.

The survey questionnaires contained 28 questions covering four sections: 1) monolithic cladding, 2) post remediation, 3) professional opinions, and 4) demographics. Section One focused on general market stigma due to the presence of monolithic cladding

---

[5] It was not permitted to email the survey questions directly to the members of REINZ and PINZ due to privacy considerations. Thus the actual survey response rates were difficult to calculate as the exact number of people who received the web survey invitation contained in the organisations' weekly newsletter was unknown. Some members may simply not read the weekly newsletter or may treat the newsletter email as spam.

13

on residential dwellings built during the 1990s to 2000s. Post remediation stigma was studied in Section Two. In particular, property professionals were surveyed on their opinion of the existence and economic impact of post remediation stigma when considering two very similar properties where one has leaked and been remediated and the other has never leaked. Factors in terms of why a post remediation stigma might exist are studied in Section Three. Demographic information of survey participants is included in Section Four. The cover letter and survey questionnaires are contained in Appendix A.

Results and discussion

Sample composition

Panel A of Table 1 shows the demographic information of the survey sample. As expected, the sample is relatively even in terms of occupation with 49% of the sample being real estate agents and 46% being property valuers. The sample was dominated by respondents who had a working experience over 20 years (42%) and a higher education bachelor degree (56%). Most respondents were male (71%) and over 50% were based in the Auckland, Wellington and Canterbury regions.

Panel B of Table 1 shows the respondents' involvement and working experience related to leaky homes. Among all survey participants, 87% have been involved with valuing, managing, consulting or marketing a property affected by leaky home syndrome. 53% of all survey participants had first-hand experience and 39% of all participants had indirect or general experience when they characterised their responses to the survey questions. Therefore, the survey participants were considered to be knowledgeable and experienced in

answering and assessing stigma implications in this survey, even though the survey sample size was relatively small.[6]

<Insert Table 1 about here>

Factors associated with the post remediation stigma using the PCA analysis

Ten intangible market factors were considered in the survey as the possible cause of post remediation stigma. Questions were designed using a 5 point Likert scale of level of agreement, which were coded 'strongly disagree' 1, 'disagree' 2, 'neither agree nor disagree' 3, 'agree' 4, and 'strongly agree' 5. An average score for each question is calculated and used as an indicator for the level of agreement. A higher score will indicate a stronger agreement and vice versa (see Appendix B for the summary statistics). Since those factors are likely correlated to each other, they were further analysed using a PCA technique. The results of the PCA analysis are given in Table 2.

<Insert Table 2 about here>

The PCA analysis has compressed 10 intangible market factors into three essential components. The first component is associated with the problems of monitoring, financing and selling a remediated leaky home. Quality of remediation work and regulatory standards are categorised as the second component. Even when remediation has been done to regulatory standards, there is a perception of quality uncertainty as the same weather tightness problems may recur. Permanent publically available information about

---

[6] A prize draw ($100 cash draw each for five) had been set up to encourage more people to participate in the survey.

15

remediation work on a leaky building is viewed as the third component. In line with the labelling theory in psychology[7], it is likely that public listing of information on defective properties will lead to the majority attaching a negative symbol to remediated leaky homes.

Price discount due to stigma using the OLS analysis

Table 3 presents the results of property sale price discount due to stigma damages. Question 1 is about general market stigma; Questions 2, 3 and 4 are about additional post remediation stigma in the presence of general market stigma; Question 5 is about post remediation stigma net of general market stigma. Panel A shows the average sale price discount due to general market stigma is 11.09% for a residential dwelling built in the 1990s to 2000s using monolithic cladding and having no history of leaking based on a positive weather tightness report. In other words all monolithic clad homes, regardless of condition, will suffer a general market price discount of 11.09% on average due to concern about weathertightness. In New Zealand it is difficult for a house buyer in the market to differentiate a sound monolithic look house from one that has leaked. Repairs are not always noted on the publically available property records and there is no robust code inspection.[8] Based on the lemon theory proposed by Akerlof (1970), the market discounts all monolithic look houses. The findings are in line with Rehm (2009) who found that a general market stigma for leaky buildings existed in the Auckland region, New Zealand and the price

---

[7] Labelling theory is related to symbolic-interaction as people take actions on what they see and expect others to do. The theory implies that people tend to negatively label those deviants from the norm. For more information about the labelling theory, please refer to Becker (1963).

[8] A Land Information Memorandum report on a property can be purchased from local Councils throughout New Zealand, however this may not have all details relating to a building's weathertightness. The best option for most home buyers is to have an inspection undertaken by an independent qualified and experienced inspector prior to purchasing, to identify any risk areas of weathertightness. The cost for obtaining a comprehensive weathertightness report can be very expensive for potential home buyers due to the hidden nature of problems.

discount was about 5% for monolithic clad single family homes and 10% for multi-unit dwellings.

Panel B shows the price change of leaky monolithic clad homes after remediation. For a remediated leaky monolithic clad dwelling with new monolithic look cladding as needed and a new code compliance certificate issued by the territorial local authority, the average valuation/sale price discount compared to the value if the property has no history of leaking and a positive weather tightness report is 5.31% for an isolated defect, 8.18% for a moderate defect, and 9.97% for a severe defect.[9] Since the remediated property still has monolithic look cladding, it is essentially the same as a monolithic clad property with no leaking history. As shown in the survey question 1 of Table 3 the market treats all monolithic clad houses as "lemons" and discounts them accordingly whether or not they have leaked. For this reason, any post remediation stigma must be in addition to general market stigma if any. For a remediated leaky dwelling with new monolithic look cladding, not only an 11% value loss due to general market stigma, but also a residual value loss of 5-10% due to post remediation stigma, depending on the severity of the leaky problems. Changing property cladding from monolithic to traditional look will help to reduce the general market stigma but not totally eliminate stigma damages. For a property where a serious defect has been remediated with traditional look cladding and a new code compliance certificate issued, the average post remediation sale price discount is 3.73% on a sound, comparable traditional look dwelling. The findings support the existence of post remediation stigma, even though

---

[9] An isolated defect is considered a remediation cost of less than $30,000 per dwelling unit, e.g. a leaking problem of a balcony; a moderate defect is considered a remediation cost between $50,000 and $150,000 per dwelling unit, e.g. defective window installation; a severe defect is considered a remediation cost of over $200,000 per dwelling unit, e.g. recladding and replacement of decayed timber framing.

17

the remediation work has met the regulatory standards and the dwelling has been altered

such that it has a new traditional look.

<Insert Table 3 about here>

The mean and median are estimated close to each other in Table 3. However the

standard deviations are generally large as compared to their mean values. This could be

mainly due to the small survey sample size or demographic differences among the

respondents. To validate the above price discount due to stigma, an OLS regression method

for the same survey sample was employed to check if the findings are due to the different

respondents' demographic background or, more importantly, to find out what market

factors are the main driver for stigma damages. The dependant variable is property price

changes as indicated by the survey participants. The OLS regression results are represented

in Table 4. In general respondents' demographic background is not statistically significant in

estimating stigma damages across all models in the OLS regression. Occupation is

negatively related to the price change, indicating respondents with higher occupation scores

such as valuers and building consultants (as they were coded) tend to discount more in

assessing the value loss for remediated properties than respondents with lower occupation

scores such as real estate agents and other property professionals. People with more

professional experience and higher education tend to hold a positive view on remediation.

Female respondents are more confident than their male counterparts in dealing with

remediated properties with severe defects, but less confident with an isolated or moderate

defect. Among the three identified PCA market factor components, component 1 is

statistically significant for the price discount, while components 2 and 3 are insignificant.[10]

Overall, the findings show that market factors associated with the additional problems of

monitoring, financing and selling of remediated properties are the main driver for stigma

damage. The results are robust to individual characteristics of survey respondents.

<Insert Table 4 about here>

Time length of stigma using the MNL analysis

The survey statistics on the time length of stigma damages is presented in Table 5.

The survey question itself is asking "in your professional opinion how long will the

property's valuation/sale price be discounted?". For the purpose of studying general market

stigma, a time length of less than 5 years is coded 1, 5 to 10 years is coded 2, 10 to 20 years

is coded 3, and more than 20 years is coded 4. For the purpose of analysing post

remediation stigma, a time length of no difference after remediation is coded 1, less than 5

years is coded 2, 5 to 10 years is coded 3, 10 to 20 years is coded 4, and more than 20 years

is coded 5.[11] The results show that stigma damages can last for a long time. Leaky building

syndrome was first systematically identified in the Hunn Report (2002) and 13 years later

property professionals still believe leaky home stigma will carry on for another 10 to 20

---

[10] Component 1 is associated with the additional cost of monitoring, financing and selling of remediated properties; Component 2 is associated with the quality of remediation and regulatory standards; Component 3 is associated with the labelling effect. The principal components are determined using the PCA technique discussed in section 5.2.

[11] The time categories are pre-set in the survey questions. The relative time intervals are carefully considered in the survey as it is unlikely the respondents have a precise knowledge about the time length of stigma damages in years, rather than at 5 or 10 years interval. In our view, 5 years could be classified as temporary or short term for stigma damages, 5-10 years is medium term, 10-15 is long term, 15-20 years is long term permanent, and over 20 years is permanent.

years. The findings support Shi (2004) where he found leaky building stigma in the New Zealand housing market will not gradually diminish over time.

<Insert Table 5 about here>

To see if the time length of stigma damage will depend on individual characteristics of the respondent, an MNL model was applied to test the response probabilities. The results are given in Table 6. The base group/status is less than 5 years in the general market stigma analysis, while no difference is used as the reference group in the post remediation stigma analysis. Panel A shows the MNL results of time length of general market stigma and Panel B shows the results of time length of stigma damages after remediation. Both Panel A and Panel B show that individual characteristics of the respondents have statistically influenced only the 5-10 years group outcomes and no other group outcomes have been affected. For the time length of general market stigma, another score of occupation has increased the odds between 5-10 years and the base status (less than 5 years) by 278%, and negative 91% for education. Since the respondent's occupation was coded from 1 to 5, representing other, real estate agent, property manager, building consultant, and valuer respectively, the results imply that valuers and building consultants tend to choose longer time length than other professionals such as real estate agents for the general market stigma analysis in Panel A. For the post remediation stigma analysis in Panel B, valuers and building consultants tend to choose a stigma time period under 10 years compared to real estate agents. Property professionals with higher education tend to choose a short time length for both the general market and post remediation stigma analysis. Female professionals are more likely to choose a shorter stigma period than male professionals after remediation.

<Insert Table 6 about here>

20

Conclusions

Understanding and quantifying the intangible market factors which have caused stigma is crucial in correctly assessing the stigma effect on the property valuation/sale price of defective properties. In this study it has shown that both general market and post remediation stigmas exist for residential dwellings using monolithic cladding built in the 1990s to 2000s in New Zealand. The findings are in line with the lemon theory introduced by Akerlof (1970), where quality uncertainty causes the market to penalise all monolithic look or defective properties. Among all factors the additional problems of monitoring, financing and selling remediated properties are identified as the main drivers causing stigma damages. Second is the quality of remediation and regulatory standards. The labelling effect of listing the remediated properties on public domains comes third. Simply meeting the regulatory standards for the remediation work will not totally eliminate the negative stigma effect on remediated leaky homes. It is critical to understand that stigma relates to both real and perceived risks. Even after experts determine that no real risk exists, perceived risk as seen by the public can still persist and is powerfully influenced by social and cultural context.

The price discount due to leaky home stigma is significant. For monolithic clad dwellings general market stigma is estimated at 11% on average. There may be a further 5-10% post remediation stigma in the presence of general market stigma, depending on the severity of leaky problems. Recladding monolithic clad dwellings in more traditional materials can help reduce the negative stigma effect but it does not eliminate it completely. This study indicates that seriously defective dwellings which have been remediated, reclad in more traditional materials and issued with new code compliance certificates have a sale

21

price discount of 3.73% when compared with traditionally clad dwellings with no history of leaking. The nature of stigma is of long term. Although the leaky home syndrome in New Zealand was first systematically identified in the Hunn Report 2002, a decade later the market perception is that stigma will remain for the next 10-15 years from the current survey. Both the price discount and time length due to stigma damages are robust to individual characteristics of the respondent.

One limitation of this research is its small sample size, a factor unfortunately unavoidable in social science research based on the survey method. Nevertheless information contained in this study is very useful for social scientists to explore stigma damages and persistence over time. Further research into actual historical sale prices of those remediated monolithic properties in a hedonic regression framework would add significant value on this topic, whenever a large amount of remediated property transaction data is available.

22

References

Akerlof, G.A. (1970) The market for "lemons": quality uncertainty and the market mechanism. *The Quarterly Journal of Economics*, 84(3), 488-500.

Arens, S.B. (1997) The valuation of defective properties: a common sense approach. *Appraisal Journal*, 65(2), 143-149.

Baroni, M., Barthélémy, F. & Mokrane, M. (2007) A PCA factor repeat sales index for apartment prices in Paris. *Journal of Real Estate Research*, 29 (2), 137-158.

Becker, H. (1963) *Outsiders*. New York: Free Press.

Bell, R. (1997) *The comprehensive real estate handbook*, 2nd ed. Littleton, United State of America: Melange Media Corporation.

Bond, S. (2001) Stigma assessment: the case of a remediated contaminated site. *Journal of Property Investment & Finance*, 19(2), 188-210.

Bourassa, S.C., Hamelink, F., Hoesli, M. & Gregor, B.D. (1999) Defining housing submarkets. *Journal of Housing Economics*, 8, 160-183.

Bourassa, S.C., Hoesli, M. & Peng, V.S. (2003) Do housing submarkets really matter? *Journal of Housing Economics*, 12 (1), 12-28.

BRANZ, (2001) *On the face of it: getting the best out of monolithic claddings*. BRANZ Seminar Series 2001.

Chalmers, J. A. & Roehr, S. A. (1993) Issues in the valuation of contaminated property. *The Appraisal Journal*, 61(1), 28-41.

Gregory, R.S. & Satterfield, T.A. (2002) Beyond perception: the experience of risk and stigma in community contexts. *Risk Analysis*, 22(2), 347-358.

Hunn, D. (2002) *Report of the overview group of the weathertightness of buildings to the building industrial authority*: Building Industry Authority, Wellington, New Zealand.

Johnson, K.H. & Salter, S.P. (2001) Exterior insulation and finish systems: the effect on residential housing prices and marketing time. *Journal of Real Estate Research*, 22(3), 289-311.

Jolliffe, I.T. (2002) Principal component analysis. New York: Springer.

Kiel, K.A. & McClain, K.T. (1996) House price recovery and stigma after a failed siting. *Applied Economics*, 28, 1351-1358.

Kilpatrick, J.A. (2000) Valuation implications of EIFS. Paper presented at Mealey Publications Conference: emerging litigation areas: construction defects, Marina del Rey, CA, November.

Kilpatrick, J.A., Brown, D.C., & Rogers, R.C. (1999) The performance of exterior insulation finish systems and property value. *Appraisal Journal*, 67(1), 83-89.

Kinnard, W.N. & Worzala, E.M. (1999) How North American appraisers value contaminated property and associated stigma. *The Appraisal Journal*, 67(3), 269-278.

Kohlhase, J.E. (1991) The impact of toxic waste site on housing values. *Journal of Urban Economics*, 30, 1-26.

Lentz, G. H. & Tse, K. S. M. (1995) An option pricing approach to the valuation of real estate contaminated with hazardous materials. *Journal of Real Estate Finance and Economics*, 10, 121-144.

Michaels, R.G. & Smith, V.K. (1990) Market segmentation and valuing amenities with hedonic models: the case of hazardous waste sites. *Journal of Urban Economics*, 28, 223-242.

McClelland, G.H., Schultze, W.D. & Hurd, B. (1990) The effect of risk beliefs on property values: a case study of a hazardous waste site. *Risk Analysis*, 10, 485-497.

McLean, D.G. & Mundy, B. (1998) The addition of contingent valuation and conjoint analysis to the required body of knowledge for the estimation of environmental damages. *Journal of Real Estate Practice and Education*, 1(1), 1-19.

Mundy, B. (1992a). Stigma and value. *The Appraisal Journal*, 60(1), 7-13.

Mundy, B. (1992b)The impact of hazardous materials on property value. *The Appraisal Journal*, 60(2), 155-162.

Mundy, B. (1992c) The impact of hazardous and toxic material on property value: revisited. *The Appraisal Journal*, 60(4), 463-471.

Morris, B. (2011) Leak Crisis will hit every pocket. *The New Zealand Herald*, July 2, http://www.nzherald.co.nz/nz/news/article.cfm?c_id=1&objectid=10735864.

Muldowney, T.J. & Harrison, K.W. (1995) Stigma damages: property damage and the fear of risk. *Defense Counsel Journal*, 62(4), 525-538.

Öven, V.A. & Pekdemir, D. (2006) Office rent determinants utilising factor analysis – a case study for Istanbul. *Journal of Real Estate Finance and Economics*, 33 (1), 51-73.

Patchin, P. J. (1988) Valuation of contaminated properties. *The Appraisal Journal*, 56(1), 7-16.

Patchin, P. J. (1991) Contaminated properties - stigma revisited. *The Appraisal Journal*, 59(2), 167-172.

PricewaterhouseCoopers (2009) *Weathertightness – estimating the cost*: Report prepared for the Department of Building and Housing, Wellington, New Zealand.

Rehm, M. (2009) Judging a house by its cover: leaky building stigma and house prices in New Zealand. *International Journal of Housing Markets and Analysis*, 2(1), 57-77.

Schulze, W. & Wansink, B. (2012) Toxics, toyotas, and terrorism: the behavioral economics of fear and stigma. *Risk Analysis*, 32(4), 678-694.

Shi, S. (2004) *An analysis of leaky home stigma impacts on residential property*: Centre for Housing Research New Zealand.

Simons, R. & Throupe, R. (2005) An exploratory review of the effects of toxic mold on real estate values. *The Appraisal Journal*, 73(2), 156-166.

Simons, R.A. (2006) *When bad things happen to good property*. Washington, D.C.: Environmental Law Institute.

Simons, R.A. & Saginor, J.D. (2006) A meta-analysis of the effect of environmental contamination and positive amenities on residential real estate values. *Journal of Real Estate Research*, 28(1), 71-104.

Slovic, P. (1987) Perception of risk. *Science*, 236(4799), 280-285.

Syms, P. (1995) Environmental impairment: an approval to valuation. Paper presented at the Cutting Edge Conference, Royal Institution of Chartered Surveyors, Aberdeen, Scotland, September.

Syms, P. (1997) Perceptions of risk in the valuation of contaminated land. *Journal of Property Valuation & Investment*, 15(1), 27-39.

Weber, B.R. (1997) The valuation of contaminated land. *Journal of Real Estate Research*, 14(3), 379-398.

Wilson, A. R. (1994) The environmental opinion: basis for an impaired value opinion. *The Appraisal Journal*, 62(3), 410-423.

Wilson, A. R. (1996) Emerging approaches to impaired property valuation. *The Appraisal Journal*, 64, 155-170.

Wiltshaw, D.G. (1998) Stigma, perception and the remediation of contaminated land. *Journal of Property Research*, 15 (4), 285-303.

Wooldridge, J. M. (2010) Econometric analysis of cross section and panel data. Cambridge, Massachusetts: The MIT Press.

Appendix A: Survey questionnaire

SECTION 1: MONOLITHIC CLADDING

The following questions are about the economic impact that "leaky building syndrome" is having on the valuations and sales prices of residential properties built using a "monolithic cladding" system during the period 1994 to 2005.

We want to know what effects, if any, this "leaky building" association is having on the current valuations and sales prices for this type of house.

Question 1.1: Imagine that a residential property built in the 1990s or 2000s, using monolithic cladding, came on the market today. This property has no history of leaking and has a positive weather tightness report.
Would you discount the valuation/sales price of this property because it is constructed using a monolithic cladding system?

- Yes

- No, the monolithic cladding will neither increase nor decrease value

- No, the monolithic cladding will increase value

- Depends

Question 1.2: Based on the above question. In your professional opinion how much would you discount the valuation/sale price of this property?

	0	5	10	15	20	25	30	35	40	45	50
Percentage price discount											

Question 1.3: Based on the above question. In your professional opinion how much would you increase the valuation/sale price of this property?

	0	5	10	15	20	25	30	35	40	45	50
Percentage price increase											

Please explain

Question1.4: In your professional opinion how long will the property's valuation/sale price be discounted?

- Less than 5 years

- 5 to 10 years

- 10 to 20 years

- More than 20 years

26

SECTION 2: POST REMEDIATION

These questions are about possible residual value loss following remediation of a leaky home. We want to know what effect, if any, remediation has on the current valuation/sale price for this type of house.

Question 2.1: Imagine that a residential property built in the 1990s to 2000s, using monolithic cladding, came on the market today. The property has leaked but been remediated with new "monolithic look" cladding as needed and a new code compliance certificate is issued by the Territorial Local Authority.

In your professional opinion how much would you discount or increase the valuation/sale price of this property compared to the value if it has no history of leaking and a positive weather tightness report? Please indicate discount or increase for the three situations outlined below.

	Percentage Price Change										
	Decrease									Increase	
	-50	-40	-30	-20	-10	0	10	20	30	40	50
Isolated defect, remediation cost of less than $30,000 per dwelling unit (e.g. a balcony)											
Moderate defect, remediation cost between $50,000 and $150,000 per dwelling unit (e.g. defective window installation)											
Severe defect, remediation cost of over $200,000 per dwelling unit(e.g. recladding and replacement of decayed timber framing)											

Imagine that a residential property built in the 1990s to 2000s, using monolithic cladding, came on the market today. The property has had a serious defect and has been remediated with "traditional look" cladding and a new code compliance certificate is issued by the Territorial Local Authority.

27

Question 2.2: In your professional opinion how much would you discount or increase the valuation/sale price of this property compared to other similar houses, built in the 1900s to 2000s, with "traditional look" cladding, no history of leaking and a positive weather tightness report?

Percentage Price Change

	Decrease									Increase	
	-50	-40	-30	-20	-10	0	10	20	30	40	50
Severe defect, recladding and replacement of decayed timber framing											

Question2.3: In your professional opinion, for how long will a residual value price difference last?

	Less than 5 years	5 to 10 years	10 to 20 years	More than 20 years	No difference after remediation
Severe defect, remediation with monolithic cladding	●	●	●	●	●
Severe defect, remediation with "traditional look" cladding	●	●	●	●	●

Question 2.4: In your professional opinion, what is the most likely reason that a remediated property could sell for a higher price than it would sell for if it had never leaked?

- Because the remediation meets current regulatory standards
- Because building materials and building methods will be superior
- Because part of the building is of new construction
- Because of the new warranty for the remediation work
- Other, please explain

Question2.5: In your professional opinion, what is the most likely reason that a remediated property could sell for a lower price than it would sell for if it had never leaked?

- Because the remediation work may leak in the future
- Because weather tightness problems may develop in other parts of the property
- Because current regulatory standards are inadequate
- Because of public information about the remediation work to the property
- Other, please explain

28

SECTION 3: PROFESSIONAL OPINION

In your professional opinion to what extent do you agree or disagree with the following statements regarding remediated leaky homes with a new code compliance certificate?

Question 3.1: Banks are less likely to lend on a remediated leaky home as compared to the same home with no history of leaking and a positive weather tightness report?

Strongly Disagree	Disagree	Neither Agree or Disagree	Agree	Strongly Agree
●	●	●	●	●

Question 3.2: If Banks are lending on a remediated leaky home, the interest rate charged will be higher as compared to the same home with no history of leaking and a positive weathertightness report

Strongly Disagree	Disagree	Neither Agree or Disagree	Agree	Strongly Agree
●	●	●	●	●

Question 3.3: If Banks are lending on a remediated leaky home, the required loan to value ratio will be lower as compared to the same home with no history of leaking and a positive weathertightness report

Strongly Disagree	Disagree	Neither Agree or Disagree	Agree	Strongly Agree
●	●	●	●	●

Question 3.4: Due diligence costs with a remediated leaky home are going to be higher than for the same home with no history of leaking

Strongly Disagree	Disagree	Neither Agree or Disagree	Agree	Strongly Agree
●	●	●	●	●

Question3.5: The same weather tightness problems may recur even though the remediation has been done to regulatory standards

Strongly Disagree	Disagree	Neither Agree or Disagree	Agree	Strongly Agree
●	●	●	●	●

Question 3.6: Please indicate how confident you are that a remediated leaky home will not leak again in the future, assuming the remediation has been done to regulatory standards

Not at all confident	Not confident	Neutral	Somewhat confident	Very confident
●	●	●	●	●

Question 3.7: Marketing a remediated home is going to take longer than marketing the same home with no history of leaking

Strongly Disagree	Disagree	Neither Agree or Disagree	Agree	Strongly Agree
●	●	●	●	●

Question 3.8: Media exposure about remediation work to a leaky building will have a detrimental effect on the property's sale price

Strongly Disagree	Disagree	Neither Agree or Disagree	Agree	Strongly Agree

29

●　　　　　●　　　　　●　　　　　●　　　　　●

Question 3.9: Publically available District Council records or Body Corporate information about remediation work to a leaky building will have a detrimental effect on the property's sale price

Strongly Disagree	Disagree	Neither Agree or Disagree	Agree	Strongly Agree

●　　　　　●　　　　　●　　　　　●　　　　　●

Question 3.10: The general public does not understand leaky building problems

Strongly Disagree	Disagree	Neither Agree or Disagree	Agree	Strongly Agree

●　　　　　●　　　　　●　　　　　●　　　　　●

SECTION 4: EXPERIENCE and BACKGROUND

This section provides information about your professional background and experience with leaky buildings.

Question 4.1: What is your current occupation?

- Valuer
- Real estate agent
- Building consultant
- Property manager
- Other

　　　[   ]

Question 4.2: How long have you been working as a property professional?

- Less than 5 years
- Between 5 and 10 years
- Between 10 and 15 years
- Between 15 and 20 years
- Over 20 years

Question 4.3: Have you ever been involved with valuing, managing, consulting or marketing a property affected by conditions similar to any of the scenarios in this survey?

- Yes
- No

Question 4.4: How would you best characterize your responses to the survey questions?

- They are based on my first-hand experience
- They are based on my indirect experience
- They are based on my general real estate experience
- They are mostly guesses based on limited personal experience

Question 4.5: I am comfortable advising clients on the purchase of a remediated leaky home
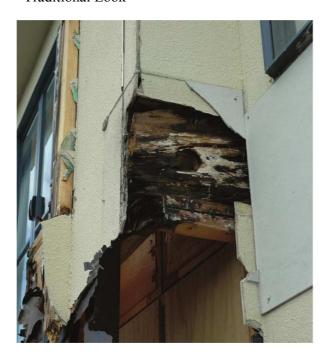
30

Strongly Disagree	Disagree	Neither Agree or Disagree	Agree	Strongly Agree
●	●	●	●	●

Question 4.6: What is the highest level of schooling that you have completed?

- High school
- Trade certificate or diploma
- Bachelor degree
- Master degree or higher

Question 4.7: Gender

- Male
- Female

Question 4.8: Indicate the region where you usually work

Question 4.9: Please leave your name and contact email if you want to be in a prize draw for participating in this survey

- Name

- Email

31

Appendix B: Summary statistics of factors associated with the post remediation stigma

No.	Questions	Mean	Median	Standard deviation
1	Banks are less likely to lend on a remediated home as compared to the same home with no history of leaking and a positive tightness report?	3.34	3	1.06
2	If banks are lending on a remediated leaky home, the interest rate charged will be higher as compared to the same home with no history of leaking and a positive watertightness report?	2.51	2	0.84
3	If banks are lending on a remediated leaky home, the required loan to value ratio will be lower as compared to the same home with no history of leaking and a positive tightness report?	3	3	0.99
4	Due diligence costs with a remediated leaky home are going to be higher than for the same home with no history of leaking and a positive tightness report?	3.56	4	1.01
5	The same weather tightness problems may recur even though the remediation has been done to regulatory standards.	3.24	3	1.01
6	How confident a remediated leaky home will not leak again in the future, assuming the remediation has been done to regulatory standards?	2.97	3	1.17
7	Marketing a remediated home is going to take longer than marketing the same home with no history of leaking and a positive tightness report	3.78	4	1.06
8	Media exposure about remediation work to a leaky building will have a detrimental effect on the property's sale price	3.76	4	0.82
9	Publicly available District Council records or Body Corporate information about remediation work to a leaky building will have a detrimental effect on the property's sale price	3.49	4	1.02
10	The general public does not understand leaky building problems	3.55	4	1

This table summarises the professional opinion to what extent they agree or disagree with the above statements. A 5 point Likert scale of level of agreement is used in the survey and later coded for analysis. 'strongly disagree' is coded for 1, 'disagree' is for 2, 'neither agree nor disagree' is for 3, 'agree' is for 4, and 'strongly agree' is for 5.

Figure 1: Defective leaky homes and full cladding replacement from "Monolithic Look" to "Traditional Look"

(Sources: BRANZ Build, www.buildmagazine.org.nz)

(Sources: BRANZ Weathertight, www.weathertight.org.nz)

Table 1: Summary statistics

Panel A: Demographic information		
Occupation		
Valuer	33	46%
Building consultant	2	3%
Property manager	1	1%
Real estate agent	35	49%
Other	1	1%
Working experience		
Less than 5 year	14	19%
5-10 years	10	14%
10-15 years	8	11%
15-20 years	9	13%
Over 20 years	30	42%
Education		
High school	11	15%
Trade certificate/diploma	20	28%
Bachelor degree	31	43%
Master degree/higher	9	13%
Gender		
Male	51	71%
Female	19	26%
Region		
Auckland region	16	23%
Wellington region	20	29%
Canterbury	3	4%
Other	31	44%
Panel B: Leaky home experience		
Involvement		
Yes	61	87%
No	9	13%
Knowledge		
First-hand experience	37	53%
Indirect experience	9	13%
General experience	18	26%
limited personal experience	6	8%

This table summarises the demographic characteristics of survey participants. Survey questions are detailed in Appendix A.

Table 2: PCA analysis results of intangible factors associated with the post remediation stigma

No.	Factors	Component 1	Component 2	Component 3
1	Banks are less likely to lend on a remediated home as compared to the same home with no history of leaking and a positive tightness report	0.91		
2	Due diligence costs with a remediated leaky home are going to be higher than for the same home with no history of leaking and a positive tightness report	0.82		
3	If banks are lending on a remediated leaky home, the required loan to value ratio will be lower as compared to the same home with no history of leaking and a positive tightness report	0.81		
4	Marketing a remediated home is going to take longer than marketing the same home with no history of leaking and a positive tightness report	0.76		
5	Media exposure about remediation work to a leaky building will have a detrimental effect on the property's sale price	0.72		
6	If banks are lending on a remediated leaky home, the interest rate charged will be higher as compared to the same home with no history of leaking and a positive tightness report	0.69		
7	The general public does not understand leaky building problems	-0.5		
8	How confident a remediated leaky home will not leak again in the future, assuming the remediation has been done to regulatory standards?		0.79	
9	The same weather tightness problems may recur even though the remediation has been done to regulatory standards.		0.57	
10	Publicly available District Council records or Body Corporate information about remediation work to a leaky building will have a detrimental effect on the property's sales price			0.73

This table presents PCA analysis for compressing 10 possible factors which may affect people's perception/attitude for a remediated leaky home into a few main groups.

Table 3: Property valuation/sale price change due to a leaky home stigma

No.	Scenarios	Observations	Mean (%)	Median (%)	Standard deviation (%)
		Panel A: General market stigma			
1	No leaking history but is in monolithic cladding	81	-11.09	-10	10.73
		Panel B: Post remediation stigma			
2	Isolated defect remediated with new "monolithic look" cladding	62	-5.31	-5	9.37
3	Moderate defect, remediated with new "monolithic look" cladding	61	-8.18	-10	15.68
4	Severe defect, remediated with new "monolithic look" cladding	60	-9.97	-10	20.57
5	Severe defect, remediated with new "traditional look" cladding	62	-3.73	-5	12.95

This table presents the perceptions of property professionals regarding the property valuation/sale price discount due to a leaky home stigma. Question 1 is about general market stigma; Question 2, 3 and 4 are about additional post remediation stigma in the presence of general market stigma; Question 5 is about post remediation net of general market stigma. The data source is survey response collected by the authors.

Table 4: OLS regression results of property valuation/sale price change due to leaky home stigma

	Model (1)	Model (2)	Model (3)	Model (4)
	Isolated defect "monolithic look"	Moderate defect "monolithic look"	Severe defect "monolithic look"	Severe defect "traditional look"
Constant	-5.342	-12.931	-18.116	-9.264
	(5.73)	(9.56)	(12.13)	(8.34)
Occupation	-1.905	-1.485	-2.177	-2.155
	(1.31)	(2.18)	(2.76)	(1.93)
Experience	1.121	1.918	1.192	2.607 *
	(1.00)	(1.68)	(2.14)	(1.47)
Education	1.311	1.015	3.961	0.35
	(1.67)	(2.78)	(3.53)	(2.47)
Gender	-5.622	-2.384	3.068	5.443
	(3.46)	(5.77)	(7.26)	(5.09)
Principal component 1	-3.843 ***	-7.759 ***	-11.836 ***	-4.699 **
	(1.42)	(2.37)	(3.15)	(2.01)
Principal component 2	0.057	-0.752	-5.225	-3.653
	(1.49)	(2.49)	(3.14)	(2.20)
Principal component 3	-2.109	-1.232	0.741	-2.632
	(1.33)	(2.22)	(2.77)	(1.96)
Adj. R square	0.156	0.127	0.268	0.088
Obs.	62	61	60	62

This table presents the OLS regression results of a property valuation/price change on individual characteristics of respondents and their principal component scores based on the PCA analysis. Respondent's occupation is coded from 1 to 5, representing other, real estate agent, property manager, building consultant and valuer, respectively. Experience is coded from 1 to 5, representing less than 5 years, between 5 and 10 years, between 10 and 15 years, between 15 and 20 years, and over 20 years, respectively; Education is coded from 1 to 4, representing high school, trade certificate or diploma, bachelor degree, and master or higher degree, respectively; Gender is a dummy variable, which equals 1 if the respondent is a female and 0 otherwise. Principal component 1 represents the ongoing monitoring and additional financing cost for defect properties, principal component 2 represents the adherence for the regulatory standards, and principal component 3 represents for the labelling effect of defect properties. Statistical significance: *<0.10, **<0.05, ***<0.01.

Table 5: Summary statistics of time length of stigma

No.	Scenarios	Observations	Mean score	Median score	Standard deviation
		Panel A: General market stigma			
1	No leaking history but is in monolithic cladding	67	3.00	3	1.00
		Panel B: Post remediation stigma			
2	Severe defect, remediated with new "monolithic look" cladding	60	3.33	3	1.14
3	Severe defect, remediated with new "traditional look" cladding	61	3.05	3	1.23

This table summarises the time length of leaky building stigma. The survey question itself is asking "in your professional opinion how long will the property's valuation/sale price be discounted?". The time length measurement is classified into four categories in Panel A and five categories in Panel B. In Panel A, less than 5 years is coded for 1, 5 to 10 years is coded for 2, 10 to 20 years is coded for 3, and more than 20 years is coded for 4. In Panel B, no difference after remediation is coded for 1, less than 5 years is coded for 2, 5 to 10 years is coded for 3, 10 to 20 years is coded for 4, and more than 20 years is coded for 5. A higher score indicates a longer time period.

Table 6: The time length of stigma based on the multinomial logit model

	Panel A: General market stigma			Panel B: post remediation stigma			
	5-10 years	10-20 years	> 20 years	< 5 years	5-10 years	10-20 years	> 20 years
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Constant	5.52	3.5	8.05	0.70	3.28	3.71	3.34
	(4.30)	(4.36)	(4.29)	(3.11)	(2.06)	(2.19)	(2.43)
Occupation	1.33*	0.89	0.41	0.32	0.17	-0.29	-0.39
	(0.72)	(0.70)	(0.66)	(0.68)	(0.41)	(0.45)	(0.53)
Experience	-0.61	-0.35	-0.66	-0.17	-0.15	-0.16	0.02
	(0.69)	(0.70)	(0.68)	(0.47)	(0.33)	(0.35)	(0.40)
Education	-2.38**	-1.41	-1.74	-0.58	-0.71	-0.54	-0.77
	(1.20)	(1.17)	(1.12)	(1.15)	(0.69)	(0.72)	(0.81)
Gender	1.5	0.65	-0.35	-19.46***	-0.23	-0.23	-0.53
	(1.58)	(1.56)	(1.53)	(0.00)	(1.13)	(1.20)	(1.37)
Observations	67			60			
Percent correctly predicted	0.47			0.46			
Log-likelihood value	67.58			107.10			
Pseudo-R-squared	0.336			0.185			

This table presents the multinomial logit regression analysis. The dependent variable is the time length status and independent variables are individual characteristics of respondents. The base time length status for Panel A is less than 5 years, while the base time length status for Panel B is no difference after remediation. Statistical significance: *<0.10, **<0.05, ***<0.01.