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Sustainable adaptive reuse – economic impact of cultural heritage

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Abstract

Purpose – The purpose of this paper is to investigate the positive externalities of adaptive reuse of heritage buildings and the economic impact on adjacent residential property prices as adaptive reuse is emerging as a significant heritage management and cultural heritage conservation practice recognized by the International Council on Monuments and Sites.

Design/methodology/approach – Through mixed methodologies of hedonic price model and case studies of three tenement houses in Hong Kong, this paper argues that the adaptive reuse of heritage buildings increases the values of residential properties within the district and revitalizes the area economically and culturally because of the positive externalities generated from the cultural heritage.

Findings – The findings have identified key cultural heritage values of adaptive reuse via the case studies as well as the major intangible cultural values associated with the heritage assignment. On the other hand, the hedonic regression also verifies that key variables such as heritage completion and distance from heritage show significance to the property prices of adjacent residential units.

Practical implications – The research is useful for heritage conservationists, policy makers and urban planners in other cities with regards to management and implementation of sustainable cultural heritage revitalization schemes for economic benefits.

Originality/value – The research is original in its scope and context, and is one of the first of its kind for a high-density metropolitan context in Hong Kong and is significant in demonstrating the economic impact of the heritage practice of adaptive reuse.

Keywords Sustainable development, Cultural heritage, Adaptive reuse, Hedonic price model, Economic impact

Paper type Research paper

1. Introduction

Hong Kong is one of the densest metropolitan cities in the world. Due to its unique history of Chinese sovereignty and British rule as a colony, there is a strong influence from both Chinese and western cultures in the city's urban development. Many of Hong Kong's architecture possess unique cultural heritage values that encompass a mix of Chinese and European neoclassical influence (Cody, 2002). A unique architectural typology from the colonial era, known as *tong lau* – a tenement residential block of three to four stories high built in the late nineteenth century to 1960s – is known for its fine cultural heritage values. Some *tong lau* have been identified for a pilot Revitalizing Historic Buildings Scheme by the Hong Kong Government. This paper will illustrate the positive externalities of adaptive reuse through three case studies of tenement *tong lau* along with a hedonic price model.

2. Background

The Burra Charter by the Australian National Committee of International Council on Monuments and Sites (ICOMOS) has identified major cultural heritage conservation practices, namely, preservation, restoration, reconstruction and adaptive reuse (Douglas, 2002; Australia ICOMOS, 2013). Among these mainstream methodologies, adaptive reuse emerges as a

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recognized methodology when a building is no longer performing its designated function (Austin *et al.*, 1988). Adaptive reuse is argued to bring new facilities to the area and can have a positive impact to the neighborhood (Ashworth, 2011; Douglas, 2002; Leichenko *et al.*, 2001; Listokin, 2012; Listokin *et al.*, 1998) and the overall urban development (Ki and Wadu Mesthrige, 2011).

This paper will first identify some of the cultural heritage values through case studies of three *tong lau* in Hong Kong, to be followed by a hedonic regression study to understand the economic impact on the neighborhood residential property prices in the district.

3. Literature review

Extensive literature has covered wide aspects of adaptation options (Mason, 2005), covering topics such as the extension of building life cycle (Kohler and Hassler, 2002), cultural heritage policies related to building adaptation (Berens, 2010; Noonan, 2007), viability and applications (Bullen, 2007; Bullen and Love, 2010), benefits to the construction industry (Bon and Hutchinson, 2010), contributions to environmental sustainability (Kincaid, 2000; Wilkinson *et al.*, 2009), as well as key environmental concepts such as the minimization of materials and pollution. Ball (1999, 2002), Douglas (2002), Navrud and Ready (2002), Wadu Mesthrige and Poon (2015) studied the reuse potential and vacant industrial premises. Langston *et al.* (2008) developed an adaptive reuse potential (ARP) model in the decision-making processes for property stakeholders toward more sustainable practices and strategies by providing means to identify and rank existing buildings that have a high potential for adaptive reuse. The ARP model is an important step toward making better use of the facilities and driving adaptive reuse practice to more sustainable social and economic outcomes (Langston *et al.*, 2008). On the other hand, hedonic regression models have been used to study the economic impact of urban renewal of a district (Chau and Chin, 2003). Empirical studies found out that urban renewal projects have both positive and negative externalities depending on the timing of public announcement (Chau and Wong, 2014). Meanwhile, Ahlfeldt and Maennig (2010) conducted a hedonic study in Berlin and Asabere *et al.* (1994) did a similar study in Philadelphia to look at the economic impact of cultural heritage using a hedonic price model. Boyle (2001) used a hedonic model to study the impact of environmental externalities. Based on previous literature, this paper sets itself apart from the existing literature review by employing both qualitative and quantitative methodologies to examine how the adaptive reuse of cultural heritage impacts the adjacent property economically, socially and culturally.

4. Cultural heritage revitalization – case studies in Hong Kong

The three *tong lau* case studies are selected from the pilot "Revitalizing Historic Buildings through Partnership Scheme[1]" (R-Scheme) by the Development Bureau of the Hong Kong Government since 2008 to adaptively reuse suitable government-owned historic buildings into good and innovative use and to create appreciation of the cultural heritage values of built heritage.

The first one is Lui Seng Chun (LSC), a project which is now a Chinese Medical Centre. The second is Blue House Cluster (BHC), which aims to show the positive effect from a community engagement point of view. The last is Comix Home Base (CHB), a project initiated by the Urban Renewal Authority (URA), where add-on social values from community facilities helped create a sustainable neighborhood. Since sustainable development is multi-faceted and can yield positive benefit to our society, these three case studies are selected to feature initiatives that can maximize social and cultural benefits, and minimize resources and negative contribution to the sustainable development as stipulated in the "sustainability index" (Langston and Shen, 2007).

With a wide range of building typologies in Hong Kong that are rich in heritage characteristics (Henderson, 2001; Lu, 2009), it is difficult to quantify the values of a building given that much of these values are culturally and aesthetically symbolic (Henderson, 2008).

A recognized methodology – a Heritage Impact Assessment – is necessary to give scale to the value assessment of historic buildings. In Hong Kong, the Antiquities and Monuments Office conducted a territory-wide Heritage Impact Assessment of over 1,400 historic buildings from 1996 to 2000 (Chan and Lee, 2017; Lu, 2009). These buildings were given a proposed grading to reflect their values as assessed against the established six criteria[2], namely:

(1) historical value;

(2) architectural/aesthetic value;

(3) group value;

(4) social and cultural values;

(5) authenticity; and

(6) rarity.

In general, heritage buildings in Hong Kong are assessed by these six identified criteria (Taylor, 2004). However, it is recognized that not all buildings possess all of the heritage values. For each case study, only key values are highlighted.

4.1 Case study 1: LSC – cultural heritage value in community service

Originally completed in 1931, LSC is one of the oldest and most recognized traditional Chinese shop houses in Hong Kong. The historical heritage values lie in its unique clinic-related *tong lau* typology and its known history of serving the community since the early 1930s. Since April 2012, the new Chinese Medicine and Healthcare Center opened in this existing structure.

LSC illustrates positive externalities through adaptive reuse, featuring its cultural heritage values as the building has maintained its unique "character defining elements (CDEs)" (Blake, 2000). According to the Heritage Impact Assessment, CDEs are the materials, forms, locations, spatial configurations, uses and cultural associations or meanings that contribute to the heritage value of a historic place, and which must be retained in order to preserve its heritage value. CDEs are the key attributes to heritage preservation and are identified by conservationists and architects to facilitate conservation decisions in accordance to the existing conservation policies (Hassler *et al.*, 2002; Tweed and Sutherland, 2007).

4.1.1 Assessment of cultural heritage values (architectural and cultural values). LSC is a typical four-story Chinese tenement building with architectural and aesthetic values (Plate 1). The architectural style of the building – square-shaped frame with a row of decorative balustrades in front – is neo-classical mixed with elements of Art Deco, which is often characterized by sweeping horizontal lines and robust classical elements. The deep verandas, together with the stone plaque marked with the name of the medicine shop at the top of the building, are all typical architectural features of pre-war Chinese tenements. LSC represents a connection between Chinese and western architecture, highlighting the strong influences from the colonial rule. While the majority of the standard terraced shop houses of the period were designed and constructed by local builders using a "pattern-book" approach[3], LSC was custom designed by an architect, thus making it one of the more distinctive shop houses from the 1930s.

The building's cultural value in relation to its urban context is as significant as its physical characteristics as it has a symbiotic relationship with one another. LSC was a well-known Chinese "bone-setting" medicine clinic – a form of traditional chiropractic practice – representing the practice of Chinese medicine in Hong Kong. LSC also produced its own medicine, which was exported overseas with a good reputation. The clinic provided major medical services to local residents in a district known for its low-income group and insufficient public medical facilities. Given the reputation of the Lui family at the time and the continual importance of Chinese

Plate 1.
LSC before revitalization

Source: AGC Design

medicine, the revitalization of the building into a modern Chinese medicine and healthcare center has allowed it to resume its service to the community, maintaining its social and cultural values in a sustainable manner (Langston and Shen, 2007; Yung and Chan, 2012) (Plate 2).

4.1.2 Summary of cultural heritage values. The adaptive reuse of LSC serves as an example of conservation in Hong Kong that caters to the needs of the local community. The revitalization of the building into a Chinese medicine and healthcare center addresses the demand for inexpensive medical services in the district, making this project socially sustainable. Stakeholders including government departments, the Legislative Council, non-profit organizations and professionals (architects and heritage consultants) all worked together to support this adaptive reuse project. While this historic building enhances people's understanding of local Chinese medicine culture, it also benefits the public as a form of social welfare. Today, LSC features guided tours for the public and offers free medical consultations four times a year, providing a chance for the community to learn and appreciate the historical and architectural features of the building while generating sustainable social, economic and cultural impact within the surrounding community (Chen *et al.*, 2018).

4.2 Case study 2: Blue House Cluster (BHC) – building community network

The BHC (BHC) is a group of tenements constructed in the 1920s and was included in the R-Scheme in mid-2009 (Plate 3). Working with grassroots organizations, the project aims to conserve the lifestyles of residents and integrate intangible heritage preservation with building revitalization. It aims to adapt the area into a multi-functional services complex incorporating the original residential components with new community services (Cheung and Chan, 2012, 2013).

Plate 2.
Façade at Streets Corner: after repair works of the façade

Plate 3.
View of Blue House from Queen's Road East in 2011

Source: LWK and Partners (HK) Ltd

4.2.1 Assessment of cultural heritage values (historical and cultural values). The BHC has special historical values as it is an illustration of the typical configuration of shops on the ground floor and residential quarters on the upper floors of early twentieth century tenement houses in Hong Kong (Plate 4). Stone Nullah Lane, the street where the BHC is

Plate 4.
Stone Nullah
Lane Façade

Source: LWK and Partners (HK) Ltd

located, was redeveloped into Chinese-styled houses for sub-division to accommodate the influx of refugees from the Mainland China in the 1850s and 1860s.

The building materials demonstrate the development of construction techniques in Hong Kong typical of the era. The cantilevered balconies were made of reinforced concrete, which was one of the earliest uses of this material for buildings in Hong Kong (Figure 1).

The revitalization project reflects cultural significance by integrating folk museum with cultural tours and exhibitions which interact with the wider community on various levels (Tang, 2016).

The project also reflects the residential significance through preserving the socio-cultural traditions, stories, and wisdom and skills of the community. Interviews and sharing sessions were carried out with the residents to collect oral histories as part of the conservation process to ensure the cultural heritage aspects are well-maintained (Thompson, 2017).

Apart from the tangible value of the historic building, there were many intangible cultural historic values such as the bonding of residents, their self-initiated social activities, sharing with district stakeholders during the course of the planning and revitalization. Many major decisions, such as the color of the external walls, were made as a result of joint participation – which shows the true spirit of bottom–up approach.

4.2.2 Summary of cultural heritage values. The BHC was one of the successful stories among Hong Kong’s myriad preservation efforts. The government had taken a big step by giving a green light to an innovative proposal that actively engaged various stakeholders including community residents and volunteers, scholars, non-governmental organizations and professionals in the planning process, thus ensuring that they were informed during the adaptive reuse process and that their views were incorporated in the plan. The community engagement process of the project consolidated local community network as they came together to work on creating a more socially-inclusive environment towards a more sustainable cultural heritage preservation (Mısırlısoy and Günçe, 2016).

Source: LWK and Partners (HK) Ltd

Figure 1.
Front elevation (Facing Stone Nullah Lane) of the Blue House

4.3 *Casestudy 3: Comix Home Base (CHB) – value adding to cultural heritage complex*
CHB is a well-recognized adaptive reuse historical building which now becomes a new home to comic professionals, comic-lovers and the public with exhibition halls, restaurants and public spaces (Plate 5). It demonstrates how to deliver revitalization

Source: LWK and Partners (HK) Ltd

Plate 5.
Current view of CHB

through adaptive reuse into an art and cultural center for the community (Charrieras *et al.*, 2018; Leong, 2013).

The project received several urban planning and design awards from the Hong Kong Institute of Planners, the Hong Kong Institute of Architects in 2013 and the Quality Building Award Committee in 2014 for the recognition of its cultural contributions to the neighborhood.

Hong Kong Arts Centre (HKAC) was selected as the main operator of CHB, which serves as a hub for comics, animation, graphic design and multi-media art. Comics was chosen as the main theme of the project as there were no venues dedicated to this sector which was a thriving and vibrant comics industry and growing economic potential in exports of comic books, action figures, animations and movies to global destinations (Wadu Mesthrige and Yung, 2018).

4.3.1 Assessment of cultural heritage values (historical, architectural and cultural values). The Mallory Street *tong lau* ensemble, dating back to 1910s, has retained most of its configuration, and its original brick and timber structure is still intact. It serves as an invaluable testimony to the changing urban landscape of Hong Kong. The original ensemble illustrates how safety and health regulatory requirements were implemented in Hong Kong (Adams and Hastings, 2001). Some characteristics such as footprint of the building, relationship of windows to rear light well, disposition of access staircase, airiness of kitchens and supporting of timber joists on brick corbels, are all subtle carriers of this architectural message related to how buildings were constructed in Hong Kong in the old days. The revitalization design not only restored these features, but also integrated modern-day functions for public to appreciate such architectural values (Plate 6).

In order to revitalize this complex to serve the community, the best approach may not be a nostalgic reversion to the distant past, but to present the contextual transformation of Wan Chai. The venue now accommodates old local brands as well as contemporary artists.

4.3.2 Public consultation and engagement. The URA adopted a public engagement approach to determine on the operation model of the Mallory Street/Burrows Street Project (Cheung, 2011). A series of territory-wide public consultation activities including workshops and questionnaire surveys were conducted at the early stage of the project to assess the aspiration of different stakeholders. The results indicated the community preference for adaptive reuse of the buildings as a place of leisure, art and culture.

Plate 6.
Elevation plan of CHB

A business plan study was also conducted to investigate the most suitable operation model for the project. "Art Community" with a diverse operation mode was recommended in the study. concept for the revitalized building catered to the public and community's aspiration for an art and culture venue as well as providing an urban park for public enjoyment.

As a result, the main operator, HKAC and the tenants were invited to communicate with the design team early on in the process, and the team was able to adjust the design to suit business and operation needs. The result conserved heritage fabric while adapted the building to a new usage.

From the three case studies, it can be seen that adaptive reuse involves a constant negotiation between historical buildings and modern regulations (Taylor, 2004). Buildings proposed for adaptive reuse were usually built to standards set in the past, and hence unable to fulfill the modern requirements for fire services and barrier-free access, among others. Substantial renovation works have to be carried out to adapt the buildings (Ryberg-Webster and Kinahan, 2014), at the price of sacrificing some of the buildings' structures to provide space to accommodate new facilities. It is suggested that a holistic approach should be considered when considering the conservation of a heritage and best endeavors should be attempted to incorporate the old with the new with considerations of the urban context, the community and ways to preserve the cultural values in a sustainable manner that can further benefit the society (Taylor, 2004).

5. Quantitative methodology – hedonic pricing model

Aside from the case studies, a hedonic regression model has been conducted on all three sites to test the economic impact on the adjacent residential properties. Based on similar studies conducted in the European context (Lazrak *et al*., 2014), this study is one of the first to look at the economic impact of built heritage in Hong Kong.

5.1 Data selection

The property transaction records were collected from the Hong Kong Economic Property Research Centre database. It is selected as the source of data for this research because it has a comprehensive coverage registered transaction records in Hong Kong. Also, it is reputable among the industry and its data is adopted and utilized by banks, surveying consultant firms and real estate agency companies (EPRC, 2018). Transaction records with missing saleable floor area information were verified by data in another public access called Centadata (2018) provided by professional real estate agencies.

The data selection principle of this research is based on the locations and transaction dates of the properties. In the locational aspect, properties which are within the displacement of 100 m from the heritage sites are examined (Figures 2-4).

For the transaction dates, properties transacted five years before the commencement of the revitalization projects to five years after the completion of the revitalization are to be included.

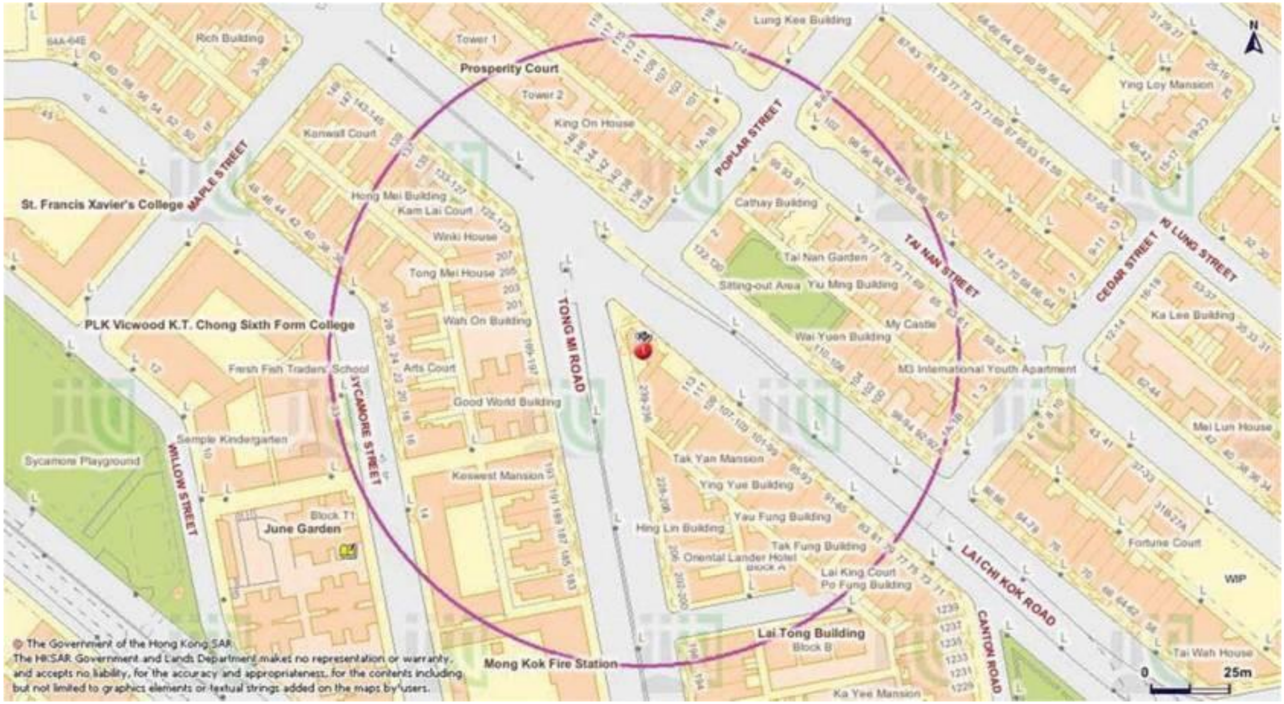
5.2 Hedonic pricing model

The hedonic pricing model is developed to investigate the effect of the three distinct revitalization projects of historical buildings on the property price of their adjacent properties:

$$Ln(RP) = C + a_1(SFA) + a_2\left(SFA^2\right) + a_3(FL) + a_4\left(FL^2\right) + a_5(AGE) + a_6\left(AGE^2\right) + a_7(SV) + a_8(COMP) + a_9(COMP \times DIST) + e.$$

The description of each variable in the model is given in Table I.

Figure 2.
Map around LSC

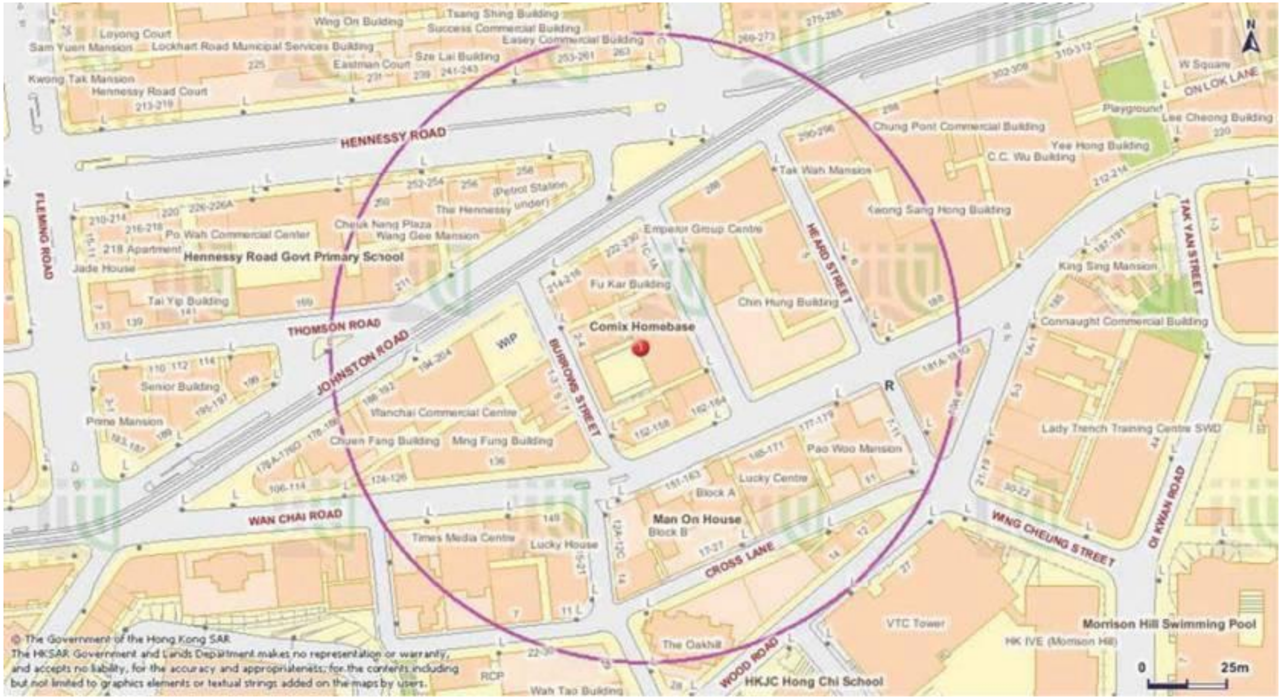


Source: GeoInfo Map

Figure 3.
Map around BHC

Source: GeoInfo Map

Figure 4.
Map around CHB



Source: GeoInfo Map

Variable	Definition
Ln(RP)	Dependent variable ¼ Natural log of real price (RP) is the real transaction price of property in Hong Kong dollars (million) deflated by the corresponding residential price index published by the Rating and Valuation Department, HKSAR
SFA	Saleable floor area (SFA and SFA^2)
AGE	Building age (AGE and AGE^2) is the age of the property, which equals to the time difference between the date of the issue of the occupation permit and the date of the transaction
FL	Floor level (FL and FL^2)
SV	Sea view dummy
COMP	Dummy variable ¼ 1 if property transacted after completion of the preservation project and 0 otherwise
DIST	Distance to the protected historic building within 100-m radius

Table I. Description of variables for the empirical model

6. Empirical results

6.1 Descriptive statistics

Tables II–IV show the data characteristics and statistics in the models of the three cases, respectively.

6.2 Regression results

The regression results of the empirical model for the three cases are presented in Tables V–VII, respectively. First of all, the Prob(*F*-statistic) of all the models is 0 percent, which is much smaller than the 5 percent significance level. The null hypothesis that all the coefficients in the regression model are 0 can be rejected, which implies that the variables we included in the model are meaningful and useful. Moreover, the research model on BHC has an adjusted R^2 above 80 percent (83.1 percent), which proves the satisfactory performance in explaining the variation in the natural log of the real property price within its sample size.

6.3 Controlled variables

The controlled variables in the model are the common structural and spatial variables in most hedonic property pricing models, including building age (AGE, AGE^2), floor level (FL, FL^2), saleable floor area (SFA, SFA^2) and sea view (SV).

	Mean	Median	Max.	Min.	SD	Observations
AGE	32.81595	34.86653	53.62902	0.873374	10.09906	933
AGE^2	1,178.768	1,215.675	2,876.072	0.762783	609.4335	933
CD^a	25.70514	0	98.93	0	37.11937	933
$COMP$	0.360129	0	1	0	0.480295	933
$DIST$	72.05802	77.01	98.93	14.23	22.907	933
FL	6.336549	6	15	1	3.884094	933
FL^2	55.22186	36	225	1	59.1756	933
$LNRP$	0.880018	0.862868	1.956615	−1.86876	0.369199	933
PRI	1	1	1	1	0	933
SFA	360.284	315	1,152	186	138.2142	933
SFA^2	148,887.3	99,225	1,327.104	34,596	126,287.8	933
RP	2.57206	2.369947	7.075336	0.154315	0.928502	933
SV	0	0	0	0	0	933

Notes: [a] CD ¼ $COMP \times DIST$

Table II. Descriptive statistics for LSC model

Table III.
Descriptive statistics for BHC model

	Mean	Median	Max.	Min.	SD	Observations
AGE	12.14316	6.078029	55.00342	0.002738	14.08674	799
AGE^2	345.6441	36.94243	3,025.376	7.50E−06	608.894	799
CD^a	28.93667	0	99.5	0	36.16047	799
COMP	0.416771	0	1	0	0.493333	799
DIST	70.50476	73.7	99.5	19.2	16.69295	799
FL	19.35294	17	49	1	14.26857	799
FL^2	577.8736	289	2,401	1	670.073	799
LNRP	2.107856	2.158294	7.015071	−0.47489	0.659412	799
PRI	0	0	0	0	0	799
RP	11.36757	8.656359	1,113.286	0.621957	39.62551	799
SFA	453.2979	457	1,520	175	184.6807	799
SFA^2	239,543.2	208,849	2,310.400	30,625	213,408.4	799
SV	0.153942	0	1	0	0.36112	799

Note: [a]*CD* ¼ *COMP* × *DIST*

Table IV.
Descriptive statistics for CHB model

	Mean	Median	Max.	Min.	SD	Observations
AGE	30.9475	32.07118	50.18207	0.049281	8.91431	532
AGE^2	1,037.063	1,028.563	2,518.24	0.002429	458.4149	532
CD^a	27.19417	0	96.2	0	37.12842	532
COMP	0.381579	0	1	0	0.486231	532
DIST	69.99981	74.6	96.2	22.5	20.99406	532
FL	11.06015	10	57	1	8.191686	532
FL^2	189.3045	100	3,249	1	340.9329	532
LNRP	1.642876	1.621969	4.613561	−3.30554	0.534317	532
PRI	0	0	0	0	0	532
RP	6.257325	5.06305	100.8426	0.036679	7.302577	532
SFA	442.5789	403	2,295	254	172.2448	532
SFA^2	225,488.6	162,409	5,267,025	64,516	345,313.8	532
SV	0.031955	0	1	0	0.176046	532

Notes: [a]*CD* ¼ *COMP* × *DIST*

Table V.
Regression result for LSC model

Variable	Coefficient	SE	*t*-statistic	Prob.
C	0.080124	0.110752	0.723451	0.4696
SFA	0.003486	0.000316	11.02361	0*
SFA^2	−1.94E-06	3.33E−07	−5.83157	0*
FL	0.008841	0.009457	0.934818	0.3501
FL^2	0.000227	0.000621	0.365784	0.7146
AGE	−0.00717	0.00524	−1.36885	0.1714
AGE^2	−6.48E-05	9.23E−05	−0.70242	0.4826
COMP	0.294133	0.050814	5.788476	0*
COMP × *DIST*	−0.00115	0.000653	−1.757	0.0792
R^2	0.42916	Mean dependent variable		0.880018
Adjusted R^2	0.424218	SD dependent variable		0.369199
SE of regression	0.280149	Akaike info criterion		0.302609
Sum squared residual	72.51874	Schwarz criterion		0.349282
Log likelihood	−132.167	Hannan−Quinn criterion		0.320408
F-statistic	86.83345	Durbin−Watson statistic		1.520255
Prob(*F*-statistic)	0			

Note: *,**Significant at 1 and 5 percent levels, respectively

Variable	Coefficient	SE	t-statistic	Prob.
C	1.091383	0.066627	16.38049	0*
SFA	0.002947	0.000185	15.96573	0*
SFA^2	−4.61E-07	1.53E−07	−3.01997	0.0026*
FL	−0.00498	0.003057	−1.62983	0.1035
FL^2	0.000192	5.99E−05	3.20495	0.0014*
AGE	−0.03061	0.00311	−9.8413	0*
AGE^2	0.000281	6.69E−05	4.197847	0*
SV	−0.00677	0.031705	−0.21345	0.831
$COMP$	0.435429	0.069492	6.265901	0*
$COMP \times DIST$	−0.00447	0.000969	−4.61599	0*
R^2	0.832503	Mean dependent variable		2.107856
Adjusted R^2	0.830592	SD dependent variable		0.659412
SE of regression	0.271409	Akaike info criterion		0.242055
Sum squared residual	58.11985	Schwarz criterion		0.30067
Log likelihood	−86.7008	Hannan−Quinn criterion		0.264573
F-statistic	435.7252	Durbin−Watson statistic		1.552732
Prob (F-statistic)	0			

Note: *,**Significant at 1 and 5 percent levels, respectively

Table VI.
Regression result for BHC model

Variable	Coefficient	SE	t-statistic	Prob.
C	1.195242	0.198125	6.032783	0*
SFA	0.002402	0.000295	8.140133	0*
SFA^2	−5.24E-07	1.50E−07	−3.49962	0.0005*
FL	−0.00337	0.005314	−0.63398	0.5264
FL^2	0.000202	0.000184	1.097586	0.2729
AGE	−0.02542	0.009108	−2.79066	0.0055*
AGE^2	0.000222	0.000168	1.321825	0.1868
SV	0.026162	0.137808	0.189848	0.8495
$COMP$	0.22638	0.098229	2.30462	0.0216**
$COMP \times DIST$	−0.00107	0.001335	−0.79937	0.4244
R^2	0.5501	Mean dependent variable		1.642876
Adjusted R^2	0.542344	SD dependent variable		0.534317
SE of regression	0.361467	Akaike info criterion		0.821328
Sum squared residual	68.20383	Schwarz criterion		0.901716
Log likelihood	−208.473	Hannan–Quinn criterion		0.852788
F-statistic	70.91765	Durbin–Watson statistic		1.797689
Prob(F-statistic)	0			

Notes: *,**Significant at 1 and 5 percent levels, respectively

Table VII.
Regression result for CHB model

6.3.1 Lui Seng Chun. The response variable (*LNRP*) is positively correlated with *SFA*. With 1 ft^2 increase in *SFA* as for an average area of 360 ft^2, the natural log of the real property price will increase for 0.21 percent. The squared term of *SFA* (SFA^2) are statistically significant at 1 percent level. Since LSC is located at the inner area of Kowloon, and the majority of the buildings have relatively lower levels (max: 15, mean: 6.33), the variable of *SV* is excluded in the model.

6.3.2 Blue House Cluster. Both of the estimated coefficients of the structural variables *SFA* and *AGE* are statistically significant at 1 percent level. Therefore, the natural log of the real property price is positively correlated with *SFA* and negatively correlated with building age (AGE). With 1 ft^2 increase in *SFA* as for an average area of 453 ft^2, the response variable will increase for 0.25 percent, yet one year increase of the building age as for an average age of 12 years, will lead to a decrease of 2.38 percent of the response variable. Additionally, the squared term of SFA, AGE and FL are also statistically significant at 1 percent level.

6.3.3 Comix Home Base. The response variable ($LNRP$) is positively correlated with saleable floor area (SFA) and is negatively correlated with building age. With 1 ft^2 increase in SFA as for an average area of 443 ft^2, the natural log of the real property price will increase for 0.19 percent. If the building age increases for 1 year as for an average age of 31 years, the response variable will decrease for 1.17 percent. Moreover, the squared term of SFA (SFA^2) are statistically significant at 1 percent level.

6.4 Variables concerning the effect of revitalization project

There are two variables ($COMP$, $COMP \times DIST$) that are used to test whether there is a significant change in the adjacent property prices before and after the completion of the revitalization project, and whether such kind of effect may vary with the distances from the heritage sites. As we can see, the signs of the coefficients of these two variables comply with our expectation in all the three cases: $COMP$ has a positive sign, while $COMP \times DIST$ has a negative sign. Therefore, the property prices can experience a positive increase after the completion of the revitalization project. However, such effect decreases with the increase of the distances away from the heritage buildings.

6.4.1 Findings on significance. In the LSC model, the dummy variable $COMP$ is significant at 1 percent level. The mean distance of properties towards the heritage site is 72.06 m, the log of real property price has increased 21.13 percent in average after the completion of the revitalization project. While in BHC, the dummy variable $COMP$ and its interactive term with the distance from the heritage ($COMP \times DIST$) are both significant at 1 percent level. With the mean distance of properties from the heritage site being 70.5 m, the log of the real property price has increased 12.03 percent in average after the completion of the revitalization project.

Last but not least, for the CHB study, the dummy variable COMP is significant at 1 percent level. The mean distance of properties towards the heritage site is 70.00 m, the log of the real property price has increased 15.15 percent in average after the completion of the revitalization project.

7. Discussion

After obtaining the results from the hedonic model, the case studies presented some qualitative support to the augment on positive externalities associated with the adaptive reuse of the cultural heritage. It was observed that added values such as community amenity improvement, public goods and social interaction can bring about both tangible and intangible positive externalities to the neighborhood as a result of the R-Scheme. The hedonic regression model generally supports the analysis and the case study of BHC has the most significant effect on the adjacent property prices among the three cases. The research model on the variations of property prices and the augment of positive impact to residential property prices as a result of cultural heritage is verified. Compared to the other two heritage sites, BHC is located in a region with high heritage density in Wan Chai, and it has a relatively larger site area. Therefore, compounding effects of adaptive reuse contribute to the additional values of the adjacent properties. For other cities which are considering adaptive reuse of cultural heritage to a new function, this study shows that a strategic urban planning scheme, along with sustainable cultural heritage management approach is essential to achieve a positive economic impact for a sustainable urban development.

Notes

1. The Revitalization Scheme was introduced by the Development Bureau in 2007, in which the Hong Kong Government allowed non-governmental organizations to apply for adaptive reuse of the vacated historic buildings owned by the Government (Council Business Division 1, 2009).
2. Historical Values, Architectural/aesthetic Values, Group Values, Social Values and Local Interest, Authenticity, and Rarity are chosen as criteria to assess heritage value of a historic buildings by the Antiquities and Monuments Office (AMO) (Antiquities and Monuments Office, 2005). The evaluation system is derived from established international documents including Venice Charter, Burra and Principles for the Conservation of Heritage Sites in China.
3. Since tenement houses were relatively standard in design, which was mainly based on the existing Building Regulations, architects usually provided typical design options for their client to choose instead of tailor-making designs for each client.

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