Unraveling the factors determining the redevelopment of Seoul’s historic hanoks

Yongchan Kwon a,1, Saehoon Kim b,2, Bonghee Jeon c,*

a Engineering Research Institute, 39-526, Architectural History Laboratory, Department of Architecture and Architectural Engineering, Seoul National University, 1 Gwanak-ro, Gwanak-gu, Seoul 151-744, Republic of Korea
b Department of Landscape Architecture with Urban Design concentration, Graduate School of Environmental Studies, Seoul National University, 82-410, 1 Gwanak-ro, Gwanak-gu, Seoul 151-742, Republic of Korea
c Department of Architecture and Architectural Engineering, Seoul National University, 39-530, 1 Gwanak-ro, Gwanak-gu Seoul 151-744, Republic of Korea

Keywords:
Traditional Korean houses
Seoul
Urban redevelopment
Historic urban artifacts
Regression analysis

ABSTRACT

Recent studies found that the number of traditional Korean houses—called hanoks—in Seoul has decreased substantially over the last 50 years. Yet very little was known about the specific causes of large-scale demolition and redevelopment of hanoks. Here, based upon newly built parcel-level datasets of all hanoks in Seoul’s 1936 boundary, our probit regression models showed that the combined effects of parcel, neighborhood, and urban-scale factors may explain the probability of hanoks’ loss between 2002 and 2013. The results indicated that hanoks that were relatively new, large, and previously converted to a different use were more likely to be lost than older, smaller, and single-family residential-use hanoks. Those with desirable environmental qualities, such as a southern orientation and being part of a cluster of hanoks, were more resistant to redevelopment. The induced-development impacts of nearby urban projects were significant but this relationship varied substantially depending on the locations of the affected hanoks.

© 2013 Elsevier Ltd. All rights reserved.

Introduction

Historic urban artifacts—including traditional houses, industrial heritage sites, or classical gardens—have tangible qualities that have sustained their long-term presence in cities. The benefits of preserving historic areas were explained by several related factors. The area, for instance, may serve as an important cultural resource in both procedural terms, e.g., providing a sense of community, and substantive considerations, e.g., being part of local landmarks, collective memories, and psychological stability (Barthel, 1996; Fitch, 1990; Rose, 1981). The pluralistic built environments associated with culture and history may contribute to the growth of the local economy with greater tourism activities (Rypkema, 1994). Additionally, adaptive re-use of historic assets may become a source of affordable housing and provide a socially desirable alternative to bulldozer-type urban renewal (Rose, 1981; Tyler, Ligibel, & Tyler, 1994). The merits seemed to progressively infiltrate into an urban planners’ decision-making processes, despite some occasional differences in planning goals, forming a so-called “uneasy alliance” between planning and preservation (Birch & Roby, 1984). But the alliance did not always lead to the careful selection of urban areas worthy of protection. In Seoul, for instance, hanoks—the traditional Korean house—were demolished at an alarming rate and scale over the last fifty years.

The term hanok (한옥, 韓屋) began to be used since the late 19th century, although its origin dates back to much earlier periods, to classify houses that were constructed with a traditional wooden structure and a style. Hanoks have three archetypal elements: bueok (a kitchen with a fireplace and a lower earthen floor), maru (a wooden-floor common space) and ondol (an underfloor-heated room) with columns and beams forming a grid system (Fig. 1). A traditional, curved roof structure is located on top of the columns. The relative term, yangok (양옥, 洋屋)—the Western-style house—was used to indicate brick or block houses with a western style introduced by foreign architects and engineers who came to Korea around the late 19th century. Hanoks comprised the majority of residential buildings in Seoul until the 1940s. Yet, hanoks’ dominance has declined since the 1950s when the construction of yangoks became widespread due to the development of mass production technology. In the 1960s, newly constructed hanoks became very few in number.
and were increasingly replaced by yangoks. From the 1980s, high-rise apartment towers with a reinforced concrete structure became a dominant type of housing in Seoul.

Prior research estimated that the number of hanoks in Seoul decreased from approximately 130,000 in the early 1960s to 24,000 in the early 2000s (Jeong, 2006; Jeon & Kwon, 2012; Song, 1990). The number of newly constructed hanoks in Seoul declined to a few hundred or less per year in the late 1960s, with only a small number of enthusiasts continuing to preserve them. Along with the decline in the number of newly built hanoks in the 1970s and 1980s, the Seoul Metropolitan Government proposed a number of downtown redevelopment projects, transforming the urban fabrics into office towers, hotels, and shopping malls. Districts like Gwancheol-dong and Mugyo-dong, for instance, became filled with mid- to high-rise office towers with an average FAR of 4.6 and 7.0, respectively (Rowe, Kim, & Jung, 2011). Thus, redevelopment projects involving low-rise hanoks were neither financially profitable nor feasible due to their limited floor areas.

Beginning in the late 1990s, hanoks have received increasing attention since preservationists and urban planners began to find an alternative way of reusing and converting their value: they began to be associated with cultural assets and a potential means of tapping into the tourism industry (Jeon & Kwon, 2012). This changing view of preservation was partly motivated by economic reasons (Jeon, 2009). Instead of risky investment in redevelopment, social enthusiasm began to shift toward preserving and re-using hanoks. Meanwhile, the “heavy hand” of Korea’s major corporations entered a buy-hanok market that turned a sizable number of hanoks into high-end second homes or private libraries (Kang, 2012). In the 2000s, several preservation policy tests were successfully implemented, such as in Insa-dong, where hanoks were mostly converted into redesigned non-residential buildings; and in Bukchon, where they were mostly renovated as high-quality residential buildings. The success was followed by the announcement of the Seoul Hanok Declaration in 2008 (by the Seoul Metropolitan Government) and the Promotion Policy of Hanok Architecture in 2009 (by the Ministry of Land, Transport and Maritime Affairs). The Hanok Declaration, for instance, led to the local government’s financing of the repairing expenses of hanoks and subsidizing the new construction of hanoks. Additionally, different types of hanoks’ typo-morphological adaptation to an urban setting began to be documented (Song & Cho, 2004). More recently, the preservation and marketing of hanoks as “Han-Style” was included in the national government’s policy. The branding efforts were intended for the support of the globalization and industrialization of the nation’s original cultural products, such as the Korean housing (hanok), letter, clothing, food, paper, and music (Lee, 2011).

The changing social perception of hanoks provided the fertile ground for better understanding the causes of their loss. A few studies have suggested mixed preliminary results. They found that the extensive loss of hanoks was either due to the lack of state mandates for preservation (Jeong, 2006) or the combined consequence of area-wide deterioration of buildings, the significant aging of occupants, and financial disinvestment (Sim & Jin, 2012). These studies illuminated some of the potentially important factors influencing hanok redevelopment but focused on a limited number of cases for investigation. The most recent and notable attempt explored the relationship between demolished hanoks and their urban morphological characteristics, such as road patterns and the shape of buildings (Baek, 2012; Baek & Ahn, 2012). This important research, however, was not designed to control for a number of district-level variables, and examined only 12 districts covering a minuscule area of Seoul. Another recent attempt proposed to build comprehensive datasets about hanoks in Seoul (Lee, Lee, & Kim, 2011). But full-scale development of data and models analyzing hanok loss was not realized.

Thus, it is still unknown whether a set of urban influences explain the loss of hanoks across the city of Seoul when substantial variations in the individual buildings’ characteristics and their spatial locations are controlled for. The objective of this study is to respond to the following questions: how many hanoks were lost—either demolished from the site or redeveloped into a non-hanok-type building—in Seoul between 2002 and 2013? More importantly, what set of parcel, neighborhood, and urban planning determinants are associated with hanok loss?

In this study, we made a complete list of all the hanoks in Seoul between 2002 and 2013. During the period, the Seoul Metropolitan Government already embarked on a comprehensive program of historic preservation, which moved planners, preservationists, and property owners closer to each other. Thus, an economic rationale,
like the short-term profitability of redevelopment, could not serve as a singularly influential factor leading to the loss of hanoks in Seoul. Intensive conflicts between preservation and redevelopment characterized the period.

A data redundancy issue found in the original data set was fixed, and the data was compared with the most recent spatial data on hanoks in 2013. Additionally, 28 potentially influential variables, ranging from building characteristics to planning districts associated with hanok redevelopment, were included in the analysis. Among them, spatial variables like travel time to Central Business District (CBD) and the number of nearby hanoks, neighborhood socio-economic characteristics like average household income, and a set of urban planning districts were incorporated. Data that had never before been analyzed in association with hanoks, such as Longitudinal Development Permit Data (LDPD) and Household Sample Survey (HSS), was also collected for analytical purposes. The LDPD encompasses the addresses, years, uses, number of floors, and areas of all of the permitted buildings for new construction in Seoul. The HSS is a unique survey data of randomly sampled households in Seoul, containing their average income and employment status by administrative boundaries (Dongs). Using the data, this study attempts to contribute to a scholarly discussion concerning the determinants of change in the historic fabric of Seoul.

Data and methods

Data

The administrative boundary of Seoul in 1936 was chosen for examining hanok loss (Fig. 2). The late 1930s represented a period of extensive urban expansion for Seoul under the Japanese' Land Readjustment policy, after the 1914 boundary change that merged Japanese military compounds into Seoul. The innermost boundary is the fortress built in the Joseon Dynasty (1394–1910). The second inner boundary, including the eastern and western areas of the wall, was designated in 1936 by the Land Readjustment policy during the Japanese colonial period (1910–1945). The outermost boundary was designated in 1963 by the Korean government.

Fig. 2. Seoul’s administrative boundary. The innermost boundary is the fortress built in the Joseon Dynasty (1394–1910). The second inner boundary, including the eastern and western areas of the wall, was designated in 1936 by the Land Readjustment policy during the Japanese colonial period (1910–1945). The outermost boundary was designated in 1963 by the Korean government.
the data, about 10% of the samples, or 2423 in number, were missing important information related to the redevelopment decision, e.g., the year of construction or the number of floors. These were removed from the data, eventually leading to 21,043 hanok samples in 2002. They were recorded as “redevelopment” = 0 if they remained as hanoks by 2013 and as “redevelopment” = 1 if they were lost. For a hanok that has experienced adaptive re-use or partial modification, the presence of its original wooden structure such as columns and structural beams was a major criteria for deciding whether a hanok was redeveloped or not.

The results were geo-referenced in ArcGIS and then matched with multiple explanatory variables based on each building’s location. District-level data (by Dong) was acquired from the Seoul Metropolitan Government for the year of 2000 to define the socio-economic and demographic characteristics of the neighborhood in which each building was located. Additionally, all of the urban planning and preservation districts at the city level were digitized, such as housing redevelopment districts, housing maintenance districts, housing improvement districts, new-town-in-town districts, district unit planning sites, and historic and cultural aesthetics districts. The first three were grouped into a single layer called “housing redevelopment district,” resulting in four urban planning districts (Fig. 3).

Methods

We applied non-linear probit regression models to investigate parcel, neighborhood, and urban planning-level determinants of the loss of hanoks between 2002 and 2013. The dependent variable was a discrete variable that was $= 1$ if a hanok was either completely demolished or redeveloped into a non-hanok-type building, or $= 0$ if it remained as a hanok. The twenty-eight explanatory variables were grouped into four categories: 1) building/parcel-level characteristics, 2) neighborhood socio-economic characteristics, 3) urban planning districts, and 4) records of nearby redevelopment projects. All of the variables were tested for multicollinearity using Pearson’s correlation and the variance inflation factor (VIF) test. Each variable group was described as follows.

Building/parcel-level characteristics

According to the rent-gap theory, a large-enough gap between the depreciating building value and the rising land value of a house may lead to the likelihood of its redevelopment (Hufbauer & Severn, 1974; Smith, 1979). The theory was consistently supported by previous studies showing a positive, significant relationship between the level of a house’s physical deterioration (e.g., age of a house) and its possibility of redevelopment (Charles, 2013). To verify this relationship, our study included various building or parcel-level characteristics like the age of a hanok, its total floor area, the number of floors, use, and other locational features, e.g., distance to transit and travel time to CBD. A preliminary description of the data showed that the relationship between age and redevelopment was reversed, i.e., the average age of redeveloped hanoks between 2002 and 2013 was younger than the remaining ones. To examine the statistical significance of the reversed age effect, a continuous age variable of hanoks—measured from the year of original construction—was incorporated into the models.

Housing redevelopment often involves an increase in the total floor area of a pre-redevelopment building. Thus, a hanok with a smaller floor area was expected to experience redevelopment more frequently than a hanok with a larger area, due to the bigger gap in floor areas between pre- and post-redevelopment. In this study, the natural logarithm of a hanok’s total floor area ($m^2$) was calculated. Additionally, discrete variables for the presence of underground floors and two or more floors above-ground were included in the models, respectively. Floor area ratio (FAR) was dropped from the model due to its significant correlation with the variable of total floor area.

In terms of use, approximately half of the hanoks in 2002 were single-family houses. This ratio was surprisingly low, considering that a predominant number of hanoks in Seoul, if not most, were originally developed for single-family residential use. Non-single-family hanoks of 2002 presented a wide variation in their uses, such as lodging, shops, restaurants, family clinics, kid-friendly museums, backyard workshops, and churches. In other cases, hanoks were subdivided into multiple rooms for rent. Here, four building-use dummy variables such as multi-unit residential, commercial, religious/sports, and office/workspace uses were included in the models.

The decision to redevelop a hanok might be affected by the presence of other nearby hanoks. For instance, a hanok belonging to a larger cluster with formal similarity could be less likely to be redeveloped than one surrounded by newly-built buildings due to a greater social valuation of clustered hanoks. To examine this
hypothesis, we calculated the number of hanoks within a 50 m distance from each building and then recorded the results for each. The distance threshold was decided based on the average length of the longer side of Bukchon’s urban blocks, where relatively well-preserved hanok districts are remaining.

The original SDI and MGDS data omitted much of the spatial information that may affect the feasibility of hanok redevelopment. In this study, each building’s location in relation to the City Wall (= 1 if a hanok is located within the wall, distance to transit (m), vehicular travel time to CBD (min), distance to major and minor roads (m), and land elevation above sea level (m) were collected and included in the models. Additionally, prior research suggested that a hanok’s orientation might be significant in the redevelopment decision (Baek & Ahn, 2012). Here, a discrete variable that equals = 1 if a hanok’s main inner space such as maru faced south and equals = 0 if not was included in the models. Other potentially important determinants of hanok redevelopment, such as the state of structural deterioration and vacancy rate, were not included in the study due to the limited data availability.

**Neighborhood socio-economic characteristics**

Residential population density (people/km²) and average household income (KRW) by district were included in the models, as the socio-economic characteristics were likely to capture some of the omitted variables’ effects on the regression models. We assumed that the higher a district’s population density, the greater the baseline demand for new housing, leading to the higher probability of hanok redevelopment. However, this relationship may be reversed if an area is overly populated beyond the capacity of infrastructural and social services. The diseconomy of scale associated with population density may cause adverse environments like overcrowding, traffic congestion, or the lack of quality educational opportunities, serving as a social obstacle in the redevelopment decision.

Developers also believe that the baseline demand for housing is not the only determinant of profitable redevelopment. For instance, a number of household characteristics, such as percentage of the aged population (>65 years, %), level of home ownership (%), and average family size, may also influence the likelihood of hanok redevelopment. All of the aforementioned socio-economic data was collected from the 2000 Household Sample Survey (HSS) conducted by the Seoul Metropolitan Government, and was included in the study.

**Urban planning districts**

Since large-scale redevelopment involves the political decisions of many stakeholders and planners political decision, whether a house is located within an urban planning district should significantly influence hanok loss. Here, at least four planning districts seemed highly influential. The Urban and Residential Renewal Act (dosi jeugeo hwanggeong jeonggibup) enacted in 2003 led to the systematic management of 888 housing rebuilding areas, 313 housing renewal areas, and 86 environmental improvement areas in Seoul under the local government’s policy direction (Seoul Development Institute, 2008). Beginning in the early 2000s, 25 new-town-in-town districts were demarcated by 2006, eventually resulting in the rather delayed redevelopment of districts like Eunpyeong and Wangsimni. Additionally, under the City Management Plan policy, the scenic and esthetic sites of Seoul—with an area of 33.5 million m², including historic preservation districts—were protected from unmitigated redevelopment (Seoul Development Institute, 2007). Lastly, 254 district unit planning areas were stipulated in 2000 for guiding the redesign of strategic urban areas like CBD and Gangnam. Based on the categories, four dummy variables indicating housing redevelopment, new-town-in-town, district unit planning, and scenic and esthetic districts were included in the analysis.

**Nearby redevelopment projects**

The urban planning districts described above may signify the local government’s planning strategy related to large-scale redevelopment. But the districts may not capture how nearby redevelopment projects have a more fine-scaled influence on the hanok change. In this study, three different types of redevelopment projects were included, such as the restoration of Cheonggyecheon—a project that converted a lifted highway into a restored urban stream running through the center of Seoul (Rowe et al., 2011); the Urban Renaissance Master Plan and related projects like Gwanghwamun Plaza and Dongdaemun Design Plaza and Park; and the redevelopment of numerous neighborhood retail buildings within the study area. The projects were all undertaken and realized in the 2000s. For the documentation of new retail buildings, the 2001–2006 LDPPD across Seoul’s residential areas was mapped in the data. A previous study found that parcels within a 500 m distance from the restored Cheonggyecheon presented significantly higher land-value premiums than sites further away (Kang & Cervero, 2009). Compared to the stream restoration, the effects of neighborhood retail development seemed to be far more localized. Thus, in this study, two dummy variables for nearby redevelopment projects were included. One was a hanok within a 500 m distance from the restored Cheonggyecheon, Gwanghwamun Plaza, or Dongdaemun; and the other was a hanok within a 100 m distance from newly developed retail buildings. The two distance coefficients were significant and positive at 1% significance level.

**Results**

**The loss of hanoks**

The total number of hanoks decreased substantially. Among the 23,466 hanoks existed in 2002, about 46% were lost (N = 10,872) due to redevelopment or complete demolition, leaving 12,594 hanoks in Seoul by 2013 (Fig. 4). The number of the remaining hanoks was less than 10% of the hanoks existed in the early 1960s (= about 130,000). The number remaining might be marginally underestimated, since unoccupied or partly-transformed hanoks were included in the estimation. Although the total number lost was substantial, the rate of loss over the years has decreased to a degree. Between 2002 and 2007, an annual rate of loss was at about 8%, based on the estimation of prior research (Kim et al., 2009). Our estimation suggested that between 2007 and 2013, the rate decreased to about 3.4% per annum. The decline appeared to be due to multiple reasons. One is probably associated with the diminished impacts that some urban redevelopment districts had on hanoks over the years, e.g., those in the recently annulled new-town-in-town districts, along with the announcement of preservation policies and increased social preferences for living in hanoks. The diminished impacts might also be associated with a housing market downturn in South Korea in the late 2000s, partly influenced by the global financial crisis. Additionally, about 90% of hanok stocks were already eliminated from Seoul over the past fifty years. This may suggest that further deterioration of the remaining hanoks with little economic incentives for redevelopment is likely to continue, probably at a slower rate of loss than before.

Out of the 10,872 lost hanoks, only 13.1% (N = 1423) were located within the City Wall of Seoul; the rest (N = 9449) were outside the wall. The result was not unexpected, since there were a far higher number of hanoks outside the wall. Nonetheless, when the difference was normalized by comparing the percentage of loss between inside and outside, only 28.2% of the hanoks inside the wall were
lost to redevelopment. This percentage was far smaller than the average hanok-loss ratio—at about 46%—over the same years. It was likely that growing investment in the adaptive re-use of hanoks acted against the rapid loss of hanoks particularly in the inner-city area.

More than half of the total losses, or about 51.0% ($N = 5550$), took place within one of the four urban planning districts. The percentage seemed fairly high considering that the designated planning districts covered a relatively smaller area of the city. Housing redevelopment districts—such as rebuilding, renewal, and environmental improvement districts—explained about 2/3rds of the losses. The second influential factor was new-town-in-town districts, which were associated with about 1610 hanoks’ loss over the years. The influence was remarkable, considering that the new-town-in-town policy was promulgated in recent years. The policy aimed for large-scaled, publicly-planned redevelopment of Seoul’s inner-city residential districts, compared to a conventional method of promoting small-scaled, privately-driven redevelopment. With the involvement of publicly appointed master planners and local government’s subsidizing of the management costs, the new-town-in-town projects at first appeared to be a novel approach of clearing out the dilapidated districts of the city. However, the indiscriminate designation of the district seemed damaging to the adaptive re-use of the city’s historic assets.

Regression analysis results

The descriptive statistics and the results of the regression analysis are presented here (Tables 1 and 2). The results show four major trends explaining the loss of hanoks in Seoul. First, relatively new, large-sized hanoks that had already experienced conversion of use were more likely to be lost. In the regression models, the log of a hanok’s total floor area, a multi-story building variable, and three of the non-residential-use variables presented positive coefficients associated with loss; also, the age of a building was negatively correlated with the probability of loss at a 1% significance level.

These findings were inconsistent with previous studies on the redevelopment of single-family houses in the United States. For instance, redeveloped single-family houses in suburban Chicago were much older than the average age of the region’s houses, according to Charles (2013). Similar findings were reported in a number of other studies. For instance, Dye and McMillen (2007) showed that the redevelopment of older, inexpensive homes in Chicago is more likely to take place. Helms (2003) reported that older, low-density houses near public transportation are more likely to be renovated. The results of our study may indicate that, unlike a relatively homogenous suburban housing area subdivided with a gridiron pattern in the United States, a number of aged hanoks in Seoul with a small building footprint might remain undervalued for an extended period of time. For instance, limited accessibility from local streets, shade from neighboring high-rise buildings, and a relatively small parcel size might further discourage a developer’s decision to redevelop rather obsolete hanoks. Although no equivalent study was undertaken, cities like Kyoto in Japan might have experienced a similar process: selective redevelopment of historic buildings in and around the inner-city area. In Kyoto’s Nishijin district, for instance, sites of formal textile industries with weaving and dyeing factories were replaced with condominiums in the 1980s, leading to the large-scale demolition of traditional wooden townhouses called Machiya (Fujitsuka, 2005). The significance of the non-residential-use variables indicated that single-family hanoks might be more resistant to redevelopment. In the same manner, hanoks that were previously renovated or partly converted to accommodate a new use seemed more susceptible to the upward real estate market cycle or stakeholders’ redevelopment decisions. The presence of a basement floor in hanoks was not a significant determinant explaining the probability of redevelopment.

Second, desirable architectural and urban design factors for a hanok seemed to lower its likelihood of redevelopment. For instance, a hanok with southern-facing living space was less likely to be redeveloped across all of the regression models. Additionally,
hanoks forming a large cluster were far less likely to be redeveloped than one relatively isolated on an urban block. The desirable qualities for preserved hanoks were consistent with a previous study (Baek & Ahn, 2011). According to our results, a hanok that was surrounded by ten more hanoks was 3.7 years younger, than the other variables were held constant at their means; also, a hanok surrounded by ten more hanoks within a 50 m distance was 3.3% less likely to be redeveloped. The two effects seemed fairly significant and may serve as important guideline for the preservation of hanoks in the urban environment.

Third, an urban planning district was probably one of the most important determinants of the loss of hanoks in Seoul. All of the four planning variables were strongly significant across the regression models at a 1% significance level. The predicted effects of each planning measure on the loss of hanoks, when other variables were controlled for, were presented in Table 2. The designation of new-town-in-town (12.3%), housing redevelopment districts (9.1%), and district unit planning areas (6.7%) were all strong indicators of loss. It seemed that the local government’s policy goal of redevelopment, i.e., stimulating the renewal of slowly-changing urban districts in the inner-city area through planning intervention, might be partly achieved. However, some districts appeared to have ended up as a policy failure in terms of selective rehabilitation of a deteriorated built environment. Our results did not support, for instance, the new-town-in-town proponents’ rationale of improving more underserviced, physically deteriorated houses through government-led planning. The average age of hanoks within the new-town-in-town districts was 2.8 years younger, and that of the lost hanoks was 3.7 years younger, than the hanoks outside the planning districts (=49.3). Additionally, no empirical evidence was found that relatively underserviced buildings were more likely to be redeveloped within the planning districts. On the other hand, the designation of scenic and esthetic districts was significantly associated with the lower probability of hanoks loss. More statistically, a hanok located within the district was about 19% less likely to be redeveloped than hanoks outside the district, when all other variables were held constant at their means.

Fourth, both the proximity to restored Cheonggyecheon (<500 m) and newly developed retail locations (<100 m) was significant and positively associated with the loss of hanoks. Urban redevelopment induced by major public and private investments is frequently forecasted and thus the results may not be particularly surprising. Nonetheless, as shown in Table 3, the redevelopment impact on hanoks varied substantially depending on their locations. For instance, although hanoks near Cheonggyecheon were generally more likely to be redeveloped than those farther away from the stream, this relationship between redevelopment and hanok loss was significant only outside the City Wall of Seoul. This suggested that hanoks near the stream were not particularly more attractive

Table 1
Descriptive statistics of variables.

<table>
<thead>
<tr>
<th>Variables</th>
<th>Units</th>
<th>Mean</th>
<th>Std. Dev.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Building age</td>
<td>years</td>
<td>48.239</td>
<td>15.660</td>
</tr>
<tr>
<td>Log of total floor area</td>
<td>m²</td>
<td>4.087</td>
<td>0.899</td>
</tr>
<tr>
<td>Below ground floors</td>
<td>0, 1</td>
<td>0.085</td>
<td>0.279</td>
</tr>
<tr>
<td>Two or more floors above ground</td>
<td>0, 1</td>
<td>0.104</td>
<td>0.306</td>
</tr>
<tr>
<td>Multi-unit residential use</td>
<td>0, 1</td>
<td>0.045</td>
<td>0.206</td>
</tr>
<tr>
<td>Commercial use</td>
<td>0, 1</td>
<td>0.104</td>
<td>0.306</td>
</tr>
<tr>
<td>Religious or sports use</td>
<td>0, 1</td>
<td>0.007</td>
<td>0.084</td>
</tr>
<tr>
<td>Office or workplace use</td>
<td>0, 1</td>
<td>0.013</td>
<td>0.112</td>
</tr>
<tr>
<td>Located within the City Wall</td>
<td>0, 1</td>
<td>0.223</td>
<td>0.416</td>
</tr>
<tr>
<td>Distance to transit (subway)</td>
<td>m</td>
<td>337.931</td>
<td>211.918</td>
</tr>
<tr>
<td>Travel time to CBD</td>
<td>min</td>
<td>6.447</td>
<td>2.518</td>
</tr>
<tr>
<td>Distance to primary roads</td>
<td>m</td>
<td>83.180</td>
<td>76.266</td>
</tr>
<tr>
<td>Distance to secondary roads</td>
<td>m</td>
<td>8.741</td>
<td>8.191</td>
</tr>
<tr>
<td>Number of hanoks (d &lt; 50 m)</td>
<td>number</td>
<td>20.752</td>
<td>14.471</td>
</tr>
<tr>
<td>Shape index of building</td>
<td>non</td>
<td>1.193</td>
<td>0.132</td>
</tr>
<tr>
<td>South orientation</td>
<td>0, 1</td>
<td>0.302</td>
<td>0.459</td>
</tr>
<tr>
<td>Elevation</td>
<td>m</td>
<td>40.481</td>
<td>18.763</td>
</tr>
</tbody>
</table>

Table 2
Regression result: Significant factors associated with the loss of hanoks (N = 21,043).

Regression coefficients (with standard errors) Change in p > |z|

<table>
<thead>
<tr>
<th>Variables</th>
<th>Dependent variable: The loss of hanok (¼ 1 if lost)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Building age</td>
<td>-0.009*** (0.001) -0.004 0.000</td>
</tr>
<tr>
<td>Log of total floor area</td>
<td>0.047*** (0.012) 0.018 0.000</td>
</tr>
<tr>
<td>Multi-unit residential use</td>
<td>0.200*** (0.047) 0.079 0.000</td>
</tr>
<tr>
<td>Distance to transit (subway)</td>
<td>-0.002*** (0.000) -0.001 0.000</td>
</tr>
<tr>
<td>Travel time to CBD</td>
<td>0.0005*** (0.000) 0.002 0.000</td>
</tr>
<tr>
<td>Distance to primary roads</td>
<td>0.006*** (0.001) 0.002 0.000</td>
</tr>
<tr>
<td>Distance to secondary roads</td>
<td>-0.008*** (0.001) -0.003 0.000</td>
</tr>
<tr>
<td>Shape index of building</td>
<td>-0.207*** (0.020) -0.081 0.000</td>
</tr>
<tr>
<td>South orientation</td>
<td>0.002*** (0.001) 0.008 0.000</td>
</tr>
<tr>
<td>Elevation</td>
<td>0.000005*** (0.000) 1.83e-06 0.008</td>
</tr>
</tbody>
</table>

Notes: Correlation coefficients of each listed variable were analyzed using multiple regression analysis based on five probit models associated with the loss of hanoks. The twenty variables were retained at 1% significance level. Four variables, such as travel time to CBD, shape index, percentage of aged populations, and average family size, were significant but removed from the models due to their collinearity with other variables. Variables like below ground floors, two or more floors above ground, office or workspace use, and the percentage of home ownerships were not significant at 10% significance level and were deleted from the table. The coefficients in the column of ‘change in probability (marginal effects)’ was calculated using the dprobit command in Stata. The regression model was statistically significant, N = 21,043, R² = 0.076, p < 0.0001. The significance level is as follows: *p < 0.10, **p < 0.05, ***p < 0.01.
for redevelopment in the inner-city area. The results were consistent with previous research, suggesting that the land-value premium along the restored stream did not always lead to prominent redevelopment in the inner-city area, making property redevelopments less profitable. On the other hand, the effects of retail development on occupants’ willingness to sell their property and post-redevelopment decision at historical sites in cities. But there was another group of hanoks that were protected from large-scale redevelopment during the 1990s. Unlike the Bukchon area, they maintained the relatively livable urban circumstances through minor, albeit less costly, adjustment. A neighborhood with continuous streetscape, good access to nearby stores, and a flexible urban grid dotted with social services and parks is perhaps best illustrated in the Bomun-dong area. The area, located outside the City Wall, was originally shaped under the Japanese Land Readjustment policy. In the 1950s and 1960s, a number of hanoks came relatively luxurious rehabilitation (Fig. 5). This was perhaps best illustrated in the Bukchon District (Fig. 6). The earliest legislation for preserving hanoks in Bukchon started in 1976. However, property owners were opposed to the legislation due to its restrictive regulation on redevelopment. In 1991, planners were not able to strictly keep their mandate to carry out the proposed preservation policy (Kim, 2005). This, in turn, was linked to a large-scale teardown of hanoks by speculative developers during the 1990s. The rapid demolition, however, halted rather abruptly in the late 1990s, due partly to Korea’s financial crisis of 1997. A number of property owners who invested heavily in hanok redevelopment went bankrupt as paying their debts to banks based on earnings from the lease of a hanok became difficult. Increases in corporate debt, widespread layoffs of laborers, and a sharp rise in interest rates on loans further debilitated the refinancing capacity of many property owners. Meanwhile, a sizable number of CEOs from large corporations in Korea—called chaebol—as well as bureaucrats and media celebrities began to purchase hanok properties in Bukchon. The events, along with the preservationists’ attempt to save Bukchon’s historic patrimony, were a catalyst for the popularity of premium-priced, rehabilitated hanoks.

Discussion

Unlike the widespread belief that an older, smaller, more deteriorated hanok was more likely to be redeveloped, our results showed that a relatively new, large-sized hanok that had been previously converted into non-residential use was more susceptible to urban change. Additionally, a preference for desirable environmental qualities, such as south-facing layouts and being part of a larger cluster of hanoks, was found to be significantly associated with hanok preservation, along with the strong effects of planning districts. Our results may suggest that the rent-gap discourse—i.e., redevelopment occurs only if the gap between a property’s original value and its most profitable use grows large enough—may not be a singular determining factor of the loss of hanoks. As surveyed by Rosato, Alberini, Zanatta, and Breil (2010), among others, economic incentives and regulatory policies do affect real estate developers’ redevelopment decision at historical sites in cities. But their sensitivity to economic gains involve multiple factors, such as the occupants’ willingness to sell their property and post-redevelopment use of the buildings. The uncertainty of converting a smaller, more deteriorated hanok into a new use may have been a hindrance to redevelopment over the past ten years. Therefore, a rather obsolete hanok requires more attention from preservation and adaptive re-use perspectives.

During the redevelopment process in Seoul, the response of hanok developers and property owners to preservation has varied. One strategy was to enhance a hanok’s desirable quality through relatively luxurious rehabilitation (Fig. 5). This was perhaps best illustrated in the Bukchon District (Fig. 6). The earliest legislation for preserving hanoks in Bukchon started in 1976. However, property owners were opposed to the legislation due to its restrictive regulation on redevelopment. In 1991, planners were not able to strictly keep their mandate to carry out the proposed preservation policy (Kim, 2005). This, in turn, was linked to a large-scale teardown of hanoks by speculative developers during the 1990s. The rapid demolition, however, halted rather abruptly in the late 1990s, due partly to Korea’s financial crisis of 1997. A number of property owners who invested heavily in hanok redevelopment went bankrupt as paying their debts to banks based on earnings from the lease of a hanok became difficult. Increases in corporate debt, widespread layoffs of laborers, and a sharp rise in interest rates on loans further debilitated the refinancing capacity of many property owners. Meanwhile, a sizable number of CEOs from large corporations in Korea—called chaebol—as well as bureaucrats and media celebrities began to purchase hanok properties in Bukchon. The events, along with the preservationists’ attempt to save Bukchon’s historic patrimony, were a catalyst for the popularity of premium-priced, rehabilitated hanoks.

But there was another group of hanoks that were protected from large-scale redevelopment during the 1990s. Unlike the Bukchon area, they maintained the relatively livable urban circumstances through minor, albeit less costly, adjustment. A neighborhood with continuous streetscape, good access to nearby stores, and a flexible urban grid dotted with social services and parks is perhaps best illustrated in the Bomun-dong area. The area, located outside the City Wall, was originally shaped under the Japanese Land Readjustment policy. In the 1950s and 1960s, a number of hanoks came

**Table 3**

<table>
<thead>
<tr>
<th>Dependent variable:</th>
<th>Within the wall</th>
<th>Outside the wall</th>
</tr>
</thead>
<tbody>
<tr>
<td>The loss of hanok ($-1$ if lost)</td>
<td>Regression coefficients ($p &gt;</td>
<td>z</td>
</tr>
<tr>
<td>Distance to Cheonggyecheon and urban projects ($d \leq 500$ m)</td>
<td>0.052 (0.061) 0.390</td>
<td>0.196*** (0.031) 0.000</td>
</tr>
<tr>
<td>Distance to new neighborhood retails ($d \leq 100$ m)</td>
<td>0.498** (0.217) 0.022</td>
<td>0.102 (0.063) 0.106</td>
</tr>
</tbody>
</table>

Notes: The significance level is as follows: *$p < 0.10$, **$p < 0.05$, ***$p < 0.01$. 

![Fig. 5. An example of the luxurious rehabilitation of a hanok in Bukchon. The project was designed by an architect Doojin Hwang.](image1.png)

![Fig. 6. The Bukchon district.](image2.png)
to fill the area’s gridiron pattern, often in proximity to public schools, administrative offices, and parks (Kwon & Jeon, 2011). Before and after a significant part of its neighborhoods was redeveloped into multi-family houses in the 1990s, hanoks in Bomun-dong were occupied by socially diverse households and remained without wholesale transformation (Figs. 7 and 8).

Simultaneously, area-wide redevelopment of fine-scaled, internally connected urban environments has wiped out a large number of hanoks throughout Seoul over the last ten years. Yet, the redevelopment was not necessarily driven by the obvious gap between pre- and post-redevelopment property values. Publicly-owned corporations, not private development ventures, played an important role in spurring hanok redevelopment in the planning districts. For instance, at least 458 hanoks in the Ahyeon new-town-in-town district and 462 hanoks in the Wangsimni new-town-in-town district were completely demolished under the local government’s redevelopment policy. Our results showed that the hanoks lost in the planning districts were neither older nor significantly more underserviced than those outside the districts. The results were consistent with the recent criticism of Seoul’s new-town-in-town policy by the Board of Audit and Inspection of Korea: “...a plan leading to the over-supply of housing stocks in Seoul” and
“unreasonable designation of housing redevelopment districts depending not on the degree of deterioration but on the evenness of the locations of the districts (Lim, 2013).”

Conclusion

Despite continued debate on the importance of historic preservation in cities, very little was known about the causes of the large-scale loss of hanoks in Seoul. In this paper, unique parcel-level spatial data on hanoks was constructed to empirically identify the potential determinants of their loss between 2002 and 2013. When multiple factors associated with hanoks were examined, the results indicated that both parcel- and urban-scale factors were significantly associated with whether they were lost or protected from redevelopment. Hanoks that were relatively new, large, and already converted to a different use were more likely to be lost than older, smaller, and single-family residential-use hanoks. This research also suggested that hanoks with desirable qualities, such as a southern orientation and membership in a cluster, were more resistant to redevelopment or demolition, which provided important implications for urban design and the planning of historic neighborhoods. Urban planning districts and nearby redevelopment projects had significant influence on the redevelopment decision. But the effects of the latter variable—redevelopment effects—varied substantially depending on the hanoks’ locational characteristics. Further elaboration on the causes of hanok loss would have been possible if detailed household data, such as years of stay, residents’ age, and vacancy rate, is available.

Acknowledgment

This work was supported by Research Resettlement Fund for the new faculty of SNU. We thank the reviewers for their insightful comments.

References


