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Announcement effects of urban regeneration plans on residential property values: Evidence from Ulsan, Korea

Abstract: This article examines whether, and to what extent, the announcement of new urban regeneration plans has influenced residential property values in Ulsan, Korea, where state-led initiatives have recently taken place to revitalize urban core areas in a more incremental and participatory manner. This is accomplished by analyzing data for single-family residential properties sold from January 2014 to December 2016 in the Ulsan Metropolitan area. A sample of 7,139 transactions is used for hedonic analysis with consideration of the detailed timing of plan information dissemination from the beginning of the planning process to the release of the final plan. The results showed that the urban regeneration strategic plan's release in November 2015 had a significant influence on the values of residential properties within and around the project sites, but this influence varied across neighborhoods. The effect of the plan's release was found to be most significant in/around the project sites where residents showed a high level of willingness to participate. In these areas, price escalations were found to occur even before the release of the final plan, suggesting that appropriate planning interventions are required at early stages of urban regeneration projects to protect vulnerable groups of residents from potential displacement.

Keywords: Urban Regeneration; Spatial Plan Information; Announcement Effect; Housing Price

1. Introduction

In this article, we examine whether and to what extent the announcement of new urban regeneration plans influenced residential property values within and around project sites in Ulsan, Korea. The urban regeneration project in Korea represents renewed efforts to revitalize urban (core) areas through a state-led initiative. Unlike conventional urban redevelopment projects that tended to transform target areas quite radically, these current efforts aim to revitalize urban neighborhoods by encouraging the active participation of residents, while minimizing the possible negative consequences of revitalization (Deakin & Allwinkle, 2007).

Although these new efforts in Korea and other places often assume that the participatory approach can effectively accomplish urban renewal in an incremental manner, researchers have increasingly questioned whether such new initiatives really enable us to attain the goal with no side effects as intended. It has been widely recognized that improvements in physical design or built environments can reduce affordability and lead to exclusion, which Talen et al. (2015) called “a central paradox in American city planning” (p.121). In many other countries, there have also been rising concerns about the possibility of inducing rapid housing price escalations, which can disproportionately impact disadvantaged groups, and other forms of exclusion associated with urban redevelopment (see e.g., Arbaci & Tapada-Berteli, 2012; Kovács, Wiessner, & Zischner, 2013; Xu & Lin, 2019). However, few efforts have been made to assess the potential consequences of these critical initiatives focusing on early stages of their implementation. Moreover, while the literature on the effects of state-led development projects after their implementation or actual construction is voluminous (De Sousa, Wu, & Westphal, 2009; Ki & Jayantha, 2010; Rodríguez & Mojica, 2009), there is relatively scarce evidence regarding how

releasing plan information in advance can shape housing market dynamics even before any development has occurred.

The present study aims to fill these gaps in the literature. Specifically, it investigates the announcement effects of urban renewal projects with careful consideration of the detailed timing of plan information dissemination from the beginning to the release of the final regeneration plan. This study further examines how the effects differ across project areas with varying levels of residents' willingness to participate in the project (that is assumed to be essential for the project success) and discusses policy implications regarding potential displacements and social justice issues.

A hedonic analysis is conducted with a focus on single-family housing transactions that took place over a three-year period (January 2014 – December 2016). It covers one year before the announcement of the start of the planning process (December 2014) and roughly one year after the release of the final plan (November 2015). The results show some evidence to suggest that the plan announcement did have an impact on the values of residential properties, presumably by providing a meaningful signal (or information) that modified the way sellers and buyers in the local property market behaved. In particular, the effects were found to be most significant within the project sites and the 300-meter buffer areas around them following the release of the final plan, but such effects were not evident during the planning or public hearing stages. Such effects appear to be most substantial in communities with a higher degree of resident willingness to participate in community revitalization efforts.

The remainder of this article is structured as follows. The background section will provide a brief review of urban regeneration projects in Korea and empirical evidence regarding the neighborhood effects of planning announcements. An overview of the study area and the

methodological approaches used for this research will then be provided, and then the study's results and findings will be presented. Finally, the policy implications of this study's findings regarding urban regeneration projects will be discussed.

2. Background

2.1. Urban regeneration in Korea

Beginning in the early 1980s, urban renewal often took place in a (somewhat) radical fashion through urban redevelopment projects that were created to expand new housing units in urban areas and improve the physical quality of residential environments (Ha, 2007). Such redevelopment projects were driven primarily by two groups of stakeholders: 1) major construction companies (developers) that brought capital into the projects and 2) housing corporations representing the residents (homeowners) of each project site. The strong coalition of these two groups seeking their own interests resulted in the quick clearing of old dwelling units for the construction of new flats, which induced a rapid increase in housing prices within the redevelopment area (Lee, 2017). Over the last decade, however, for both supply- and demand-side reasons, the provision of new housing through large-scale redevelopment projects has become less feasible. On the supply side, increasing development fees and other regulations, combined with the recent recession, have significantly reduced the profitability of redevelopment projects (Kim & Lee, 2014). Simultaneously, the demand for large-scale redevelopment projects has declined substantially along with an aging population and low national fertility rates (Seo, 2016).

More importantly, there have been rising social inequity concerns over the consequences of conventional redevelopment projects in South Korea, as there have been in many other developed and developing countries (Arbaci & Tapada-Berteli, 2012; Elicin, 2014; Freeman & Braconi, 2004; Kovács et al., 2013; Lees & Ferreri, 2016). Although it is evident that urban redevelopment projects contribute to a relatively quick expansion of the housing supply, the resulting displacement of existing low-income renters by high-income newcomers has raised critical socio-spatial issues related to equity (Ha, 2007; Lee, 2017; Shin, 2009).¹ Consequently, without any effective government interventions, many old districts in urban core areas are in a deteriorated condition, which can lead to further declines in population size and economic vibrancy.

As an alternative urban revitalization strategy, the Korean government began to initiate state-led urban regeneration projects. Unlike conventional urban redevelopment approaches, this initiative pursues sustainable urban growth and development within specific urban districts through physical, environmental, cultural, industrial, and economic regeneration efforts (Yu & Kwon, 2011). In many respect, these urban regeneration initiatives resemble community revitalization projects in their attempts to help communities identify an area's unique values and characteristics and utilize local resources for the promotion of economic, social, and cultural vitality. By preserving each community's unique heritage and physical fabric, state-led regeneration intends to minimize potential side effects like dramatic increases in housing prices and the community displacement.

¹ Some survey results suggested that nearly 80% of the original residents were displaced in the process of urban redevelopment (Ha, 2004; Shin, 2009).

However, the literature has reported that state-led regeneration projects can result in a rapid increase in housing prices and displacement of vulnerable population groups. Arbaci and Tapada-Berteli (2012), for instance, examined the influence of the PERIs (Special Plans of Interior Reform) project in Barcelona centre and found that the project triggered state-led gentrification and housing affordability issues outside the historic centre of the city. Lee (2013) also showed that a ‘mega-retail-led regeneration scheme’ in London caused a rapid change of housing price rates in surrounding deprived neighborhoods. Although future gentrification problems are predictable and the establishment of rent ceilings may reduce potential community displacement, ambiguous policies and the property market mechanism can accelerate the displacement of socioeconomically vulnerable people (Larsen & Hansen, 2008).

To mitigate such possible adverse consequences, the regeneration projects in Korea emphasize the need for public involvement. By encouraging residents to participate in creating awareness, generating ideas, providing feedback, and monitoring progress, the new initiatives attempt to generate the community support that is crucial to the success of urban regeneration projects (Jung, Lee, Yap, & Ineson, 2015). While this is not the first attempt to recognize the importance of community support behind redevelopment, the current approach is distinct from previous urban redevelopment projects in that it places emphasis on the importance of the participation of a broader group of residents at every stage of the planning and revitalization process. Another distinctive characteristic of the newly adopted urban regeneration approach is the scale of the project. Unlike the large-scale inner-city regeneration projects in other countries (Arbaci & Tapada-Berteli, 2012; Lee 2013; Larsen and Hansen, 2008; Kovacs et al., 2013), the ongoing urban regeneration in Korea is pursuing a small-scale incremental approach, and the project sites are spatially dispersed.

In 2006, several urban regeneration pilot projects were launched. In April 2013, the Korean government expanded the program nationwide by enacting the Urban Regeneration and Assistant Act. Under that legislation, each metropolitan government is required to develop its own Urban Regeneration Strategic Plan for the execution of urban regeneration projects. An essential element of these plans is the identification of urban regeneration project sites within the scope of the metropolitan area and the delineation of their spatial boundaries. For this task, consideration should be given to the socio-demographic, economic, and physical conditions of each neighborhood in the metropolitan area. Areas that have experienced substantial physical, demographic, and economic declines are supposed to be chosen for regeneration. Once the project sites are identified in the strategic plan, the local governments develop their urban regeneration action plans for those sites. The action plans contain detailed strategies and programs to be executed for the long-term revitalization of the neighborhood. Most of metropolitan governments in Korea completed and announced their urban regeneration strategic plans by the end of 2016.

2.2. Announcement effects

Plans convey information about desired outcomes and future actions, and thus the signals that they send can influence the decisions of others (Hopkins & Knaap, 2018). Since urban regeneration strategic plans contain information about where future investment is likely to be directed, the plan making and release process may affect the dynamics of the property market as both sellers and buyers respond to the plan's information. While some of the existing research on planning has examined the impacts of development on property values after plan implementations, Immergluck (2009) suggested that understanding the effects of planning

announcements before implementation is important. More spillover effects on property values in or near a government-led development project may occur through the announcement of the intended investment than following its implementation because speculation can begin when development information becomes concrete and uncertainty over the eventual implementation of the development project is substantially reduced. For this reason, a handful of studies on the impacts of large development projects have focused on changes in property values before and after the announcement of the project.

Knaap et al. (2001), for instance, investigated whether the announcement of a light rail investment project in Washington County, Oregon was capitalized into land values near future transit stations, and they reported positive effects just after the announcement of the plan. According to the authors, such capitalization near station areas encourages future transit-oriented development since increased land values might discourage low-density residential development in those areas. In a similar vein, McMillen and McDonald (2004) examined the effect of a new rapid transit line from downtown Chicago to Midway Airport on single-family house prices before and after the opening of the line. They found that after the plans for the line were well known to the public, which was 6 years before the completion of construction, housing prices began to increase near the proposed stations. Similar findings for the same project were reported by McDonald and Osuji (1995). Kavetos (2011) estimated the impact of the announcement of the London 2012 Olympics on residential property values. The results of their difference-in-differences estimation showed that the property values located in the four main host boroughs were sold at prices between 2.1 and 3.3 percent higher than the properties in a control area. Immergluck (2009) also provided an empirical examination of the effects of an announcement of a large-scale, government-led development project in Atlanta. He found that large increases in

premiums for homes occurred, particularly near lower-income neighborhoods, between 2003 and 2005, a period that corresponds to the initial media coverage of the planning process.

It is important, however, to note that plan announcements do not necessarily have strong positive effects on property values. Environmental concerns generated by new development can outweigh the amount of (anticipated) benefits (Tian, Wei, & Li, 2017). Jud and Winkler (2006), for example, found that there was a negative spillover effect within 2.5 miles of the Greensboro/High Point/Winston Salem metropolitan airport after the announcement of the airport plan raised concerns about high noise levels and other negative externalities. Gatzlaff and Smith (1993), examining the impact of the development of the Miami Metrorail system on residential property values near the stations, reported weak evidence for the existence of strong announcement effects. According to their hedonic analysis, “the impact [did] not appear to vary significantly by property distance from the station, ... [while it was] quite varied across neighborhood types” (p. 64, Gatzlaff & Smith, 1993). Dehring et al. (2007) detected a more complicated relationship between stadium announcements and residential property values. While residential property values in the city of Dallas increased right after a new stadium plan was announced, subsequent announcements of a new publicly subsidized stadium in nearby Arlington, Texas reduced residential property values because of concerns over anticipated household sales tax burdens. Some recent studies, in fact, have suggested that announcement effects may differ for different types of properties and be highly context-specific (Billings, 2011; Cohen & Brown, 2017).

Although a considerable number of studies have investigated the so-called announcement effects, the present study aims to provide new insights into the complex workings of urban (re)development and the role of plan information in shaping the dynamics. Unlike many previous

studies focusing on large-scale development projects, attention is paid here to the announcement effects of current urban regeneration projects in Korea that purposefully pursue the social and economic stability of communities through a series of incremental participatory revitalization processes. While planners expect that such a community-oriented approach may reduce the problem of displacement (Yu & Kwon, 2011), little is known about what happens in the property market when this type of revitalization plan is announced. Furthermore, this study examines how announcement effects can vary with the degree of residents' willingness to participate in the revitalization process. Community engagement has long been considered one of the most essential aspects of urban regeneration (Jung, Lee, Yap, & Ineson, 2015), but little is known about how the process can influence the way market participants respond to the formulation and announcement of urban regeneration plans. The present study hypothesizes that a higher willingness to participate in such projects may reduce uncertainty about their future success and thus increase the risk of speculation and gentrification in the project site. Finally, by investigating a medium-sized metropolitan area outside of the U.S. (Ulsan, Korea), this work complements the existing literature and expands on present knowledge about the nature of the announcement effects in various contexts.

3. Methodology and Data

3.1. Study area

With a population of 1.16 million in 2018, the study area, Ulsan, is the seventh largest city in South Korea. The city is known as the largest industrial cluster in the nation, hosting the world's

largest automobile assembly plant, operated by Hyundai, and the world's largest shipyard, operated by Hyundai Heavy Industries, in the heart of the Ulsan industrial district. Forty five percent of workers in Ulsan hold jobs in manufacturing industries, which is substantially higher than that of the national average of 24% (Lim & Park, 2016).

Ulsan's economy, however, which has relied heavily on manufacturing and exporting activities, has been threatened by the recent global economic crisis and subsequent fluctuations. Recently, the city has been experiencing the challenges of economic recession and rapid demographic shifts. Furthermore, severe competition with growing Chinese shipbuilders has caused a downturn in the shipbuilding industry. In 2013, Ulsan's economic output shrank by 4.4%, while the national economy grew by 3.6%. In 2016, for the first time since its demographic statistics were compiled in 1968, the total population in Ulsan began to decline. More importantly, the city's population has been aging, posing a significant challenge to its long-term economic vitality. Accordingly, many of Ulsan's large-scale urban renewal plans have been postponed or cancelled. These economic and demographic trends have raised concerns that the city could become the country's rust belt.

In response to the city's economic and physical decline, the Ulsan Metropolitan City has established a long-term master plan for urban regeneration. Specifically, in the following three important time points, three different forms of plan information have been disseminated to the public (Fig.1). The Ulsan Metropolitan City: (1) announced the beginning of the plan-making process in December of 2014 and signaled that its urban regeneration project would be the main government-led revitalization initiative in the city; (2) convened a public hearing in October, 2015 at which information about preliminary project area boundaries was first released; and (3)

in November, 2015, within two months of the public comment period, released a final plan providing detailed information about 13 project sites.

<< Insert Figure 1 about here >>

In its geographical delineation of the project sites, the metropolitan government conducted a comprehensive evaluation to identify areas in which urban decline took place with respect to physical, economic and demographic aspects. Based on this evaluation and the inputs gathered, the Ulsan Metropolitan City selected 13 project sites: 10 residential neighborhoods, 2 neighborhoods with commercial areas, and 1 neighborhood with a mixture of industrial complexes. Fig.2 shows where these projects sites are located in the metropolitan region and the current physical condition of several project sites.

<< Insert Figure 2 about here >>

3.2. Data

3.2.1. Study sample

This study examines the impacts of announcements of urban regeneration plans by analyzing housing value changes before and after the three time points around which plan information has been disseminated to the public, as described above. To accomplish this, we constructed a dataset that included all sales transactions that took place from January 2014 to December 2016 for single-family houses in the Ulsan Metropolitan area. This time range includes transactions that occurred from approximately one year before the plan-making process was announced to one year after the final plan was released to the public. The raw sales data source used in this study – provided by the Ministry of Land, Transport and Maritime – includes year of construction, floor and land areas, and some other attributes of individual dwelling units, but, for

the location, it only provides the street name of each unit instead of exact xy coordinates or readily geocodable street address information. Therefore, a matching process using the common data attributes of the sales transaction data records was undertaken on the building register database which contains the exact locations of buildings and other information, such as their land use, parcel size, and the year of construction. Originally, 10,190 of single-family house transactions were recorded from January 2014 to December 2016, of which 1,188 were excluded from the sample due to street address or construction year inaccuracies. Of the remaining 9,002 housing transactions matched with the building register dataset, 7,139 (79.3%) were successfully geocoded.

3.2.2. Resident's willingness to participate

It has been suggested that one of the factors critical to the success of urban regeneration projects is the active participation of residents in those projects (Yu & Kwon, 2011). Before the official announcement of the urban regeneration strategic plan, the Ulsan Metropolitan government conducted a survey of the residents living in 56 neighborhoods (dongs), asking about their willingness to participate in community projects in the future. The survey questionnaires were given to those who visited one of the 56 neighborhood offices and, on average, 54 responses were collected for each neighborhood. Willingness to participate was measured through a multi-item index composed of three items: (a) “do you think community participation is necessary for neighborhood revitalization?”; (b) “are you interested in community participation?”; and (c) “are you willing to participate in community projects in the near future?” The survey participants rated their responses on a 5-point Likert scale from 1 (*strongly disagree*) to 5 (*strongly agree*),

with high scores indicating high levels of willingness to participate. The Cronbach's alpha for this scale was 0.716. A unidimensional principal component analysis showed that this measure explained 63.9% of the variation. In this study, the survey responses were aggregated to identify two groups of neighborhoods: 1) highly motivated communities (7 project sites), which showed an aggregated score that was higher than average and 2) less motivated communities (6 project sites), which exhibited a relatively lower level of willingness to participate. As explained below, a separate investigation was conducted to examine how the effects of the announcements differed between these two groups.

3.3. Statistical analysis

In order to measure the announcement effects of the urban regeneration plan, a standard hedonic pricing model is expanded by incorporating additional spatial variables indicating distance from the project sites and distinct periods of transactions. More specifically, this study adopts the following model, developed by Immergluck (2009), with slight modifications:

$$\ln(p_i) = \alpha + \sum \beta_i S_i + \sum \gamma_i L_i + \delta Q_i + \sigma D_i + \theta B_i + \rho T_i + \tau B_i T_i + \varepsilon_i \quad (1)$$

where, p_i is the sales price of house i ; S_i represents a group of the structural features of i -th housing unit, such as building square meters (logged), lot size (logged), and age of house/structure; L_i indicates a range of the locational features, including each unit's distance to the nearest elementary, middle, and high schools and the distance to the nearest park; Q_i is a set of quarterly time dummy variables used to control for temporal variability; and D_i is a list of district dummy variables that are included to capture the fixed effect of each of the five districts in the Ulsan metropolitan area. One of the issues in hedonic analysis is omitted variable bias. Although adding dummy variables does not always control for variation in omitted variables

within districts, Kuminoff et al. (2010) showed that adding spatial fixed effects could significantly reduce the potential bias in hedonic price models.

In equation (1), B_i indicates a set of dummy variables indicating the buffer segment area where property i is located. Fig.3 illustrates these buffer zones, which lie at different distances from the project sites, including 100m, 200m, 300m, 400m, and 500m. If a housing property is located within more than one buffer zone, it was assigned to the closest one. These buffer areas were used to investigate housing price changes in locations at varying distances from the urban regeneration project sites. T_i , which is another important variable in this study, represents a set of dummy variables indicating different time points of interest. All single-family house transactions in the sample were classified into the following four time ranges: T0: 2014.01–2014.11, a (pre-) period before the announcement of the beginning of the plan-making process; T1: 2014.12–2015.09, a period between the announcement of the beginning of the plan-making process and the beginning of the public hearing meetings; T2: 2015.10–2015.11, a period between the public hearings and the release of the regeneration plan; and T3: 2015.12–2016.12, a (post-)period after the release of the final plan.

<< Insert Figure 3 about here >>

Finally, multiplying B_i and T_i , B_iT_i was included in the model to capture the announcement effects of the plan in a systematic fashion. This interaction term can show where single-family house prices tended to increase or decrease more in the four distinct periods and, thus, reveal how sellers and buyers have responded to the dissemination of the plan's information. For instance, if market participants began to interpret the plan announcement or release as a positive signal at a certain stage, the corresponding B_iT_i combinations are likely to yield a positive, significant estimate. In other words, estimating the hedonic model (equation 1) enables us to

determine whether the prices of houses located within or close to the urban regeneration project sites have increased more or less than the counterparts located farther from the project areas and to compare these patterns with the periods of plan announcement/release (Immergluck, 2009). Following Immergluck's (2009) approach, we used a heteroscedastic-robust standard error to determine the significance of independent variables. In addition, to interpret their proportional impact on the dependent variable, an adjusted exponentiated transform of the coefficients was estimated (Kennedy, 1981), as shown in Tables 2 and 3 below.

4. Results

4.1. Descriptive statistics

Table 1 provides summary statistics for the variables used in the hedonic model estimation. Of 7,139 houses, 92% were either concrete or brick structures. Compared to cities in the U.S., where the average distance to schools is nearly 10km (Santos, MCGuckin, Nakamoto, Gray & Liss, 2011), Korean cities are more compact, with a relatively short distance between housing and various destinations. In Ulsan, the nearest elementary and high schools were located within an average distance of 500m and 1,100m, respectively. Before the announcement of the beginning of the plan-making process (T0), 31.7% of the homes in the sample were sold, while 30.8% of the transactions occurred in T1. During the public hearing period (T2), 7.0% of the transactions occurred, which is the shortest period covering two months: 2015.10–2015.11. The remaining 2,174 data records (30.5%) recorded sales that took place after the release of the final plan (T3). During the three-year study period, no sharp increase or decline was found, but the number of

transactions in each month tended to be relatively small in T3. As presented in the table, 15.5% of the houses in the sample were located within the 13 urban regeneration project sites and 22.7% were within the surrounding buffer areas.

<< Insert Table 1 about here >>

4.2. Announcement effects

The results of the hedonic model estimation are presented in Table 2. For the sake of statistical simplicity, only B_iT_i interaction terms that are statistically significant (>0.05) are shown. The model indicates a relatively good overall fit (adjusted $R^2=0.764$).

<< Insert Table 2 about here >>

The relationships between housing prices and most of the independent variables are highly significant and are consistent with expectations. Housing prices in the sample decrease with an increase in the distance variables representing proximity to parks or schools. Housing units built with concrete were 27.0% more expensive than those made with brick, while all other conditions held constant. With every 10-year increase in the age of the house, the price of the houses dropped by 5%.

The housing values within the project sites are significantly lower (approximately 7.7%) than the values of properties located further than 500m from any of the project sites. This result is not surprising given that rapidly declining communities are chosen for regeneration. More importantly, the relationships between housing values and the variables used to capture the effects of the plan announcement were shown in interaction terms. In general, the coefficients on the B_iT_i interaction variables suggested that changes in housing values during T1 and T2 were not significant. The timeline that showed a clear increase in housing values was T3. After the

release of the final urban regeneration strategic plan, the price premium for the properties in the project sites is about 16.3%. Housing units located within the 100-200m and 200-300m buffer zones also have a comparable premium: 16.5% and 19.5%, respectively. The properties in the 0-100m buffer areas had a 5.3% price increase, which turns out to be statistically insignificant. These results show that properties within or near the project sites sale for higher prices than properties farther away, whereas such differences were much smaller or more insignificant in earlier stages before the final plan emerged (T1 or T2).

4.3. Influence of the willingness to participate

To examine whether the residents' willingness to participate in the project matters, a separate investigation was carried out using the same hedonic model (Table 3). As explained earlier, the entire study region was divided into two categories based on a survey of residents showing distinct levels of residents' willingness to participate: 1) highly motivated communities and 2) less motivated communities. The number of houses sold in less motivated and highly motivated communities was 3,545 and 3,594, respectively.

<< Insert Table 3 about here >>

The relationships between housing prices and other structural or locational features are not significantly different from the patterns identified from the entire sample (Table 2). In highly motivated communities, property values within project sites were 15% lower than the properties located further than 500m from the sites during T0, and then the values of the properties located within project sites continued to grow from T1 to T3. Compared to the housing values in T0, the price premium for properties in project sites in T1, T2, and T3 was estimated to be 10.9%, 17.3% and 24.6%, respectively. After the final release of the urban regeneration strategic plan (T3),

houses located in the 100-200m and 200-300m buffer zones also experienced a substantial price increase (17.6%), while the highest price premium was found within the project sites.

Fig. 4 shows the trajectories of regression-adjusted sales price premiums during the entire study period of homes located in project sites compared with those located further than 500m from the project sites. Estimated price premiums by location and time (in Table 3) were added to generate the trajectories of regression-adjusted sales price premiums. This analysis allows for a detailed comparison of sales price premiums trajectories at various distances from the project site. The T0, T1, T2, and T3 timeline corresponds with Q1-Q4, Q5-Q7, Q8, and Q9-Q12, respectively. In highly motivated communities, the property values within the project sites were substantially lower than those of the properties located remotely during T0. Since the property values in the project sites increased more quickly, the value gap between the two locations was reduced substantially during T1. From T2 through T3, the property values in the project sites kept increasing, and they eventually surpassed the values of houses further than 500m from the project sites. Meanwhile, in the less-motivated communities, where residents' willingness to participate was found to be relatively lower, no significant price premium was found until the final release of the plan. Only during T3 was a moderate level of premium increase (8.6%) for properties in the project sites detected. The property value trajectories shown in fig. 4 indicate that the growth of property values in the project sites remained similar with the growth of property values in remote locations (further than 500m from the project sites) until T2. Just after the final release of the urban regeneration strategic plan (Q9), property values in the project sites rapidly increased.

<< Insert Figure 4 about here >>

5. Discussions and Conclusion

The present study examined how the announcement of urban regeneration strategic plans can influence the values of properties located within, or close to, project sites and found some evidence to suggest the plan announcement does matter through an empirical investigation of Ulsan, Korea. Across all study areas, the release of the final plan, which includes the boundaries of the regeneration project sites, appeared to induce an increase in single-family home price premiums (by approximately by 16-20%) within 300m distance from the project sites. In particular, the announcement effects seemed to occur at an early stage of the planning process with larger price escalations in those communities with highly motivated residents.

The findings suggest that residents' willingness to participate in urban regeneration plans can have a noticeable effect on housing prices. This might be the case because a high degree of willingness to participate may indicate a strong desire among residents and homebuyers to see future regeneration in these areas, perhaps in a way that benefits them. From the perspective of market participants, this desire may indicate a lower level of uncertainty or risk in making investment decisions. With the strong desire, particularly when it is detected at an early planning stage, developers may respond to urban regeneration plans in a more active manner, having a higher level of confidence with the signal (Hopkins & Knaap, 2018). Thus, speculation might begin earlier in these highly motivated communities, than in areas where residents did not show the same level of willingness to participate or other signals that could stimulate a market response.

However, any causal relationship between willingness of residents to participate in the projects and price premiums should be inferred with caution. It is possible that such willingness to participate is a mediator between each community's initial condition (e.g., its economic struggle) and the price premium. During the T0 period, houses located in highly motivated project sites were sold much more cheaply (about 15% lower) than their counterparts more than 500 meters away. No such significant difference was found in areas where residents had lower levels of willingness to participate. This may imply that those who resided in communities that experienced a serious economic or physical decline were more likely to have higher expectations of community revitalization projects and, hence, more willingness to participate in those projects. At the same time, given the large price gap, real estate investors might view these areas as more promising investment targets.

Another notable issue is associated with the endogeneity of the project area designation. The selection of regeneration project areas is not completely independent on housing value trends. The key question regarding the endogeneity is whether or not the property value trends found in or near the regeneration project sites would have changed as detected even without the plan announcement (Immergluck, 2009). Although it is hard to assure that the regeneration site selection and associated investment plans are an entirely external shock, we presumed that the potential endogeneity problem would be relatively weak here. In the study region, state-led urban regeneration projects are inevitable public interventions to prevent the gradual physical and economic degradation of communities where private-driven redevelopment or renewal will be infeasible in the near future. Accounting for the fact that selected project areas are commonly experiencing shrinkages with respect to population, economic vitality, and physical conditions,

the growth rate of property values in the project sites can hardly be expected to be larger than those in the control areas.

Admittedly, whether the housing price increase can be viewed as a desirable outcome is context-dependent. For instance, Rodriguez and Mojica (2009) found that Bogota's Bus Rapid Transit (BRT) system caused property value increases near the BRT line and that rising property values might imply an improvement in the attractiveness of the real estate market for local public finance. In their study on light rail investments in Washington County, Oregon, Knaap et al. (2001) also assumed that land price increases would encourage high-density, transit-oriented development near the proposed station areas. These potential positive effects of housing price premium changes might also hold for our study region. However, given that the urban regeneration project sites are economically and socially distressed areas where low-income households are concentrated, a rapid housing price escalation is likely to reduce affordability and have disproportionate impacts on vulnerable populations. This will undermine the promise of urban regeneration projects or even work against the original purpose of the new, incremental approach to minimizing residential displacement in old residential districts (Cao & Lou, 2018).

This finding has significant implications for planning, particularly with respect to social equity and inclusion, as it suggests that affordability can decline much earlier than the actual project implementation. From the announcement of the outset of the plan-making process, increased public attention can raise the prices of properties in and around target communities. Somewhat ironically, such price increases can be amplified by the process of public participation which has long been promoted in the domain of urban planning, unless managed carefully. Even though government-led urban regeneration projects seek incremental revitalization of the communities, this goal cannot be successfully achieved without a proper strategy for mitigating

potential adverse consequences early in the process. It is also needed to work with other communities or jurisdictions to support relocations, when appropriate, and deal with possible spillover effects (see e.g., Oakley & Tsao, 2007; Tong & Kim, 2019).

It should be acknowledged that the present analysis has some limitations. First, while the hedonic price model showed a relatively good overall fit, it could not include all possible determinants of housing prices in the study region due to the limited availability of data. Second, approximately 20% of total single-family home transactions were excluded from the sample in the matching and geocoding processes, also due to the deficiencies in data availability. Third, while the overall sample size ($n=7,139$) is fairly large, the coefficients of some interaction terms (derived by multiplying the 100 meter-wide buffer and time period variables) relied on a small number of transactions that took place in the narrow buffer zones during a specific period of time. This might prevent the detection of a clear pattern in the distance effects. It is possible that the coefficients of the several distance intervals were insignificant because of too few observations (Knaap, Ding, & Hopkins, 2001).

However, despite these limitations, this study sheds new light on the complex behaviors of property markets over the course of planning and development and complements existing studies that have focused on large-scale projects in the U.S. The current urban regeneration initiative is one of the most important government-led projects in Korea, and similar approaches have been increasingly adopted in other countries for a more sensible revitalization of their urban cores. Although promising in many respects, however, the new initiatives need to be carefully designed and guided by evidence such as that reported in this study. Future research needs to be conducted to gain a more complete understanding of the consequences of urban revitalization in

various settings and to determine effective ways to protect vulnerable groups of residents from the early stages of urban regeneration projects.

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