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# Effects of Tax Incentive Policies for Land Use on Local Socioeconomic Conditions: A Case of Tax Policies for Urban Regeneration Projects in Republic of Korea

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**Abstract:** South Korea has implemented several housing urban regeneration projects (URPs) and offers various tax incentives to support these efforts. However, the reality is that there is insufficient empirical evidence to determine whether these incentives have a socioeconomic impact on URPs. The aim of this study is to examine the effects of tax incentives related to urban regeneration projects (URPTAX) on local socioeconomic factors, such as Gross Regional Domestic Product (GRDP), aging housing reduction, and housing prices. Fixed-effect models and cost–benefit analysis methods were employed in the study. The results demonstrate the following outcomes. Firstly, URPTAX positively contributes to an increase in GRDP, a decrease in the proportion of aging housing, and an increase in housing price fluctuations. However, the effectiveness of these effects varies between metropolitan and non-metropolitan areas. Therefore, this study suggests the significance of providing stronger tax incentives for housing URPs in non-metropolitan areas to encourage active projects and foster balanced regional development in South Korea.

**Keywords:** housing urban regeneration projects; tax incentives; socioeconomic factors; Gross Regional Domestic Product; aging housing reduction; housing prices



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## 1. Introduction

Urban planning entails determining the direction of development for an entire city by allocating limited resources in the spatial domain based on anticipated long-term demand. It additionally involves arranging urban infrastructure to proactively respond to expected demands, while maintaining an adequate level of environmental quality within the urban landscape. Urban design pertains to the collective three-dimensional form of the city, shaped by streets and buildings [1]. The main objective of urban design is to effectively arrange and synchronize the physical components of the environment to attain the communal essence of the city. This is achieved by imposing guidelines on the physical components of urban spaces, such as city blocks, plots, building heights, density, environmental problems, and architectural aesthetics, as well as particular regulatory elements [2,3].

Meanwhile, in Korea, tax reduction and exemption programs for acquisition tax, property tax, and capital gains tax were implemented to support spatial utilization via urban regeneration [4]. Landowners who sell their land for urban regeneration to collective investment entities receive the benefits of reduced capital gains taxes. If these investment entities purchase the land, acquisition taxes are exempt. In addition, the investment firm may receive a lowered property tax for the urban regeneration project (URP) implementation period. Furthermore, once buildings are sold to buyers upon project completion, there is an exemption from capital gains tax. Thus, South Korea has implemented a strong Urban

Regeneration Project-Related Tax Incentive (URPTAX) Policy, which grants tax reductions or exemptions at each phase of urban regeneration activities.

While urban regeneration is a fundamental urban policy, sustainable urban regeneration requires ensuring the viability of tax incentive systems that support such projects. Therefore, it is critical to objectively investigate the impacts of urban regeneration. This means it is important to objectively evaluate the feasibility of pursuing public investment projects, such as urban regeneration, which require substantial government funding. Causal connections between statements and a clear structure ensure a logical flow of information. Bias is avoided via hedging, and precise word choice is used throughout.

Therefore, this study analyzes the impact of tax incentives on residential URPs in Korea and their effects on the local socioeconomic environment. Specifically, the socioeconomic impacts are characterized by the generation of Gross Regional Domestic Product (GRDP), the reduction in the percentage of aging housing, and the rate of housing price fluctuations.

Most of the research to date has focused on analyzing the effects of government policies to support land use. However, there has been limited research specifically analyzing the impact of government tax incentives on land use, i.e., URPs. Nevertheless, this study contributes by examining the effectiveness of different tax incentive policies for URPs from a socioeconomic perspective.

The study is organized as follows: Section 2 provides an explanation of urban regeneration policies in South Korea and the theoretical background. Section 3 details the materials and methods, including the research model and composition of the research sample. In Section 4, the impacts of tax incentives on GRDP, the proportion of aged housing, and housing price fluctuation as socioeconomic factors are analyzed. Finally, Section 5 summarizes the research findings and introduces issues for discussion.

## 2. Urban Regeneration Policies in South Korea and Theoretical Background

### *2.1. Urban Regeneration Policies in South Korea*

Domestic URPs in South Korea have undergone several stages since the inception of the "*Create Livable Cities Project*" in 2005, followed by the "*City Vitalization Project*" in 2009, and the "*New Village Project*" in 2014 [2]. Nevertheless, the initiatives have encountered problems related to financial constraints, planning limitations, and organizational challenges. These concerns led to selecting 13 leading areas for urban revitalization, designated as test areas for pilot projects aimed at addressing and overcoming these limitations. Specialized research organizations, including the Korea Land and Housing Corporation (LH), the Institute of Architecture and Urban Space, and the Korea Land and Housing Institute assumed the role of supporting organizations.

In the following years, the scope and objectives of URPs broadened. In 2016, 33 general areas were designated. In 2017, the N*ew Deal Urban Regeneration Project* expanded to include 68 additional areas [4]. The objective of the *New Deal Urban Regeneration Project* is to comprehensively revitalize cities by enhancing the physical environment (hardware) and developing residents' capacity (software). Key objectives include establishing regional innovation hubs to restore urban competitiveness, activating local community-based governance to promote social integration, and creating tailored employment opportunities that respond to issues of urban decay. These objectives aim to create a pleasant living environment that enhances residential welfare.

The economic impact of URPs can vary depending on various factors, such as the region's characteristics, the project's scale, and implementation policies. Generally, the economic impacts of regeneration can be summarized as follows [2–5]:

- Increased Property Value: Successful urban regeneration can result in an increase in property values within the area. The restoration of historic buildings and environmental improvements can enhance the appeal of adjacent properties.
- Local Economic Stimulus: The development of new commercial and cultural amenities due to the URP can stimulate the local economy, creating new jobs and increasing consumer spending.

- Tourism and Cultural Development: The restoration or utilization of historic and cultural spaces can promote tourism and cultural industries, resulting in increased revenue from tourism and cultural consumption.
- Improving the Residential Environment: Upgrading buildings and residential facilities can enhance residents' quality of life by potentially increasing the appeal and property values of residential areas.
- Business Attraction and Investment: Successful urban regeneration can attract interest from businesses and investments in the revitalized area.
- Infrastructure Improvement: The URP can enhance local living by improving infrastructure, including roads, transit, and parks, thereby increasing the quality and convenience of life.

These economic impacts vary depending on the goals and approaches of the URP, underscoring the importance of successful project implementation and policy formulation.

### *2.2. Theoretical Background*

Bartik [5] examined the effects of the *Empowerment Zone program* in the United States and concluded that temporary labor market shocks have long-lasting consequences that persist for at least eight years. He argued that economic development policies targeted at specific regions increase labor demand and have a positive impact on the labor market. Bartik [5] predicted that the local economy's advancement would attract people to the area. Nevertheless, if new migrants gain employment opportunities over the local population and acquire work experience leading to an increase in their earning power (human capital), it is probable that primarily low-income residents will benefit from these prospects. Bartik [5], however, emphasized that owners of property in economically distressed areas tend to be non-locals, which could unintentionally benefit non-locals rather than the local residents' welfare. And Krupka and Noonan [6] reported that the *Enterprise Zone program* boosted property values by 30–40%. To estimate the program's effects, they employed a three-stage analytical process. They used census blocks, units that are more detailed than census tracts, within the third round of Empowerment Zones as a control group. However, their estimation hinged on the assumption that the designation of Empowerment Zones in the first round was exogenous.

To address endogeneity in the designation process of the *Enterprise Zone program*, Hanson [7] attempted instrumental variable estimation. He estimated that the EZ program led to an increase in median home value of over $100,000 between 1990 and 2000. However, considering that nominal housing prices in the United States increased by $40,000 during the same period, the marked increase in housing prices in economically distressed areas was not adequately explained and was therefore a limitation.

In addition, various studies have assessed the impact of French *Zones Franches Urbaines* (ZFUs). Gobillon et al. [8], Charnoz [9], Briant et al. [10], Behaghel et al. [11], and Mayer et al. [12] all investigated these effects. Gobillon et al. [8] estimated that ZFUs increased employment opportunities for local residents and resulted in a 3% decrease in short-term unemployment durations. Charnoz [9] discovered that despite a vibrant labor market leading to increased resident attraction and retention, ZFU policies were inefficient and created minor negative externalities in the surrounding areas. Meanwhile, Briant et al. [9] found that ZFU policies resulted in job creation in spatially integrated regions and impacted local wages in isolated regions. However, Behaghel et al. [11] did not find any effects of ZFU policies on employment, wages, or labor demand. Mayer et al. [12] argued that ZFU policies had a significant impact on entrepreneurship and location choice, but the latter had a substitution effect between treatment and control areas and involved relatively high relocation costs.

Salvador and Leandro [13] analyzed the impact of URPs in Spanish urban areas utilizing the Contingent Valuation Method (CVM) to assess hypothetical values. Ribeiro [14] employed economic analysis techniques, such as net present value (NPV) and financial feasibility analysis, to determine the economic impact of downtown Lisbon's urban regeneration projects. Tyler et al. [15] analyzed the socioeconomic costs and benefits of URPs on

a national level via their study 'Valuing the Benefits of Regeneration.' In Japan, objective analyses of urban regeneration projects were conducted. These include cost–benefit comparisons, assessments of the direct and spillover effects of construction investment, analyses of property supply in emergency urban regeneration areas, and evaluations of changes in population, households, employees, and annual sales before and after the designation of emergency urban regeneration areas [16,17].

Fuertes et al. [18] utilized the Social Return on Investment (SROI) approach to determine the qualitative social value of pre- and post-urban regeneration in neighborhoods. Betty et al. [19] examined the socioeconomic influence of urban regeneration policies employing the Index of Local Deprivation, which was utilized to identify *Community New Deal* project areas.

While previous studies have examined the socioeconomic impact of urban regeneration projects, research on the impact of tax incentive policies related to urban regeneration has been limited. Therefore, this study offers a unique perspective by analyzing the effectiveness of tax incentive policies in promoting urban regeneration from a socioeconomic standpoint, surpassing the scope of traditional urban regeneration projects.

## 3. Materials and Methods

### *3.1. Materials*

This study utilized authentic microdata on acquisition tax, property tax, and transfer income tax in regions designated for URPs, alongside local government statistics from the Korean Statistical Information System. The particular statistical information employed herein encompasses the following:

(a) Acquisition and real estate taxes rebate performance data are based on Article 74, Paragraphs 3 and 4, and Article 74-2 of the Special Act on Local Taxation of South Korea. These taxes apply to urban development projects, residential environment improvement projects, residential innovation district regeneration projects, development promotion zone projects, and designated declining zone development projects.

(b) Data on gross regional domestic product (GRDP), regional fiscal autonomy, proportion of aging housing, change in housing price, and housing price index can be found on the National Statistics Portal of Korea.

The initial sample consisted of a total of 1380 local government years from 2017 to 2022. However, the final sample was reduced to 1377 after excluding 3 local government years with missing data.

### *3.2. Methods*

This study categorizes the socioeconomic factors influenced by URPTAX into three main components: GRDP, reduction in the proportion of aging housing, and housing price fluctuation rate. The first objective is to analyze the impact of URPs on the GRDP of the respective regions. The dependent variable, ln(GRDP), represents the natural logarithm of GRDP for each municipality and year. The URP variable, measuring local tax reduction via residential URP, is the main variable of interest. Furthermore, the Local variable is introduced to evaluate the effect of URP on GRDP in metropolitan (*Seoul, Gyeonggi,* and *Incheon*) and non-metropolitan regions.

The dependent variable ln(GRDP) is influenced by several control variables, such as fiscal autonomy (FA), proportion of aging housing (PAH), housing price index (HPI), fixed effects (μ) of years, and metropolitan dummies. These control variables are used in Equation (1) to establish a logical flow of information and causal connections between statements.

$$ln(GRDP)_{it} = \beta_0 + \beta_1 * URP_{it} + \beta_2 * URP_{it} \times Local_{it} + \beta_3 * FA_{it} + \beta_4 * PAH_{it} + \beta_5 * HPI_{it} + \mu_{it} + \varepsilon_{it} \quad (1)$$

where

GRDP: natural logarithm of GRDP data from the national statistics portal is presented.

URP: value of "1" indicates that local governments received tax incentives due to residential urban regeneration projects, while a value of "0" indicates no such incentives were received.

Local: value of "1" if local governments are outside of Seoul, Gyeonggi, and Incheon, while assign the value of "0" if local governments are within the Seoul, Gyeonggi, and Incheon regions.

FA: a fiscal autonomy variable that is calculated by dividing the sum of local tax and extraordinary revenue by the size of the local government budget and multiplying the result by 100.

PAH: Proportion of Aged Housing variable is calculated as Proportion of Aged Housing (%) = (Number of Houses Older than 30 Years/Total Number of Houses) × 100.

HPI: Housing Price Index represents housing market fluctuations and is calculated by converting the price ratio between the housing transaction price at the time of the survey and the reference point (November 2017 = 100) to a value with a reference point of 100.

μ: Fixed Effects of year and metropolitan area dummy variables are included.

Second, to examine the impact of URPTAX policies on the reduction of the proportion of aging housing, this study analyzes the effect of tax incentives on the proportion of aged housing. The most direct impact of URPs is the reduction of the proportion of aging housing via URPs. To analyze this effect, the dependent variable is defined as the proportion of aging housing in each region. Specifically, to assess the impact of URPs in reducing the proportion of aging housing between metropolitan and non-metropolitan regions, a variable for non-metropolitan regions is included. If $\delta_2$ has a significant and positive coefficient, it indicates that the effectiveness of reducing the share of aging housing is lower in metropolitan regions than in non-metropolitan regions. Conversely, if it has a negative coefficient, it indicates that URPs have a greater impact on reducing the proportion of aging housing in metropolitan regions than in non-metropolitan regions.

$$PAH_{it} = \delta_0 + \delta_1{*}URP_{it} + \delta_2{*}URP_{it} \times Local_{it} + \delta_3{*}FA_{it} + \delta_4{*}HPI_{it} + \mu_{it} + \varepsilon_{it} \quad (2)$$

Fluctuations in housing prices can be attributed to various factors, but cross-sectional analysis enables measuring the effects of housing supply conditions and policy-driven variations in house prices. The price of houses is determined by the agreed monetary value between buyers and sellers. Similar to general economic goods, the formation of real estate prices is influenced by abstract elements such as utility, relative scarcity, and effective demand [20,21]. Furthermore, the interaction of supply and demand determines housing prices based on the principles of the market economy. The formation of housing prices is influenced by changes in economic situations, such as regional characteristics that affect local supply conditions, policy changes related to supply regulation reflecting social changes, individual characteristics, and macroeconomic shifts as noted by Kim [22]. In this context, URPs are expected to significantly impact housing price formation, which reflects housing supply conditions and policies.

Therefore, analyzing the impact of URPTAX policies on housing price fluctuations (in USD) can determine whether such projects positively or negatively affect housing prices in each region. For this analysis, this study measures the dependent variable HPF as the percentage change in housing prices. The central variables of interest are defined as the URP variable and the URP*Local variable. Additionally, this study introduces a non-metropolitan region variable to explore whether the impact of URPs on housing price changes differs between metropolitan and non-metropolitan regions.

$$HPF_{it} = \zeta_0 + \zeta_1{*}URP_{it} + \zeta_2{*}URP_{it} \times Local_{it} + \zeta_3{*}FA_{it} + \zeta_4{*}PAH_{it} + \zeta_5{*}HPI_{it} + \mu_{it} + \varepsilon_{it} \quad (3)$$

where

HPF: Housing Price Fluctuation variable, measured as the percentage change based on November 2017 as the reference point.

In Table 1, which shows the descriptive statistics of each variable, the mean of Ln(GRDP) is 15.482, distributed from a minimum of 12.536 to a maximum of 20.013, and the means of URP and Local are 45.8% and 67.2%, respectively. The remaining variables are the same as in Table 1.

**Table 1.** Descriptive statistics ($n$ = 1377).

| | Mean | Std. | Min | p25 | Median | p75 | Max |
|---|---|---|---|---|---|---|---|
| *ln(GRDP)* | 15.482 | 1.318 | 12.536 | 14.392 | 15.390 | 16.288 | 20.013 |
| *URP* | 0.298 | 0.458 | - | 0 | 0 | 1 | 1 |
| *Local* | 0.672 | 0.763 | - | 0 | 1 | 1 | 1 |
| *FA* | 21.561 | 13.455 | 4.000 | 11.2000 | 18.100 | 28.475 | 79.200 |
| *PAH* | 25.082 | 13.707 | 0.100 | 15.1000 | 23.400 | 34.800 | 70.200 |
| *HPI* | 60.348 | 47.238 | - | - | 92.600 | 98.800 | 113.800 |
| *HPF* | −0.070 | 1.147 | −5.420 | −0.2100 | 0.140 | 0.410 | 4.060 |

Note: Variable definitions are the same as those in Equation (1).

## 4. Results

### *4.1. The Impact of Tax Incentives for Urban Regeneration Projects on GRDP, Aging Housing Ratio, and Housing Price Fluctuations*

The analysis regarding the influence of tax incentives on URP on regional gross domestic product (GRDP) indicates that these projects enhance the GRDP. However, this effect is comparatively lower in non-metropolitan regions. As presented in Table 2, the URP coefficient is statistically significant, with a value of 0.2475 ($p < 0.05$). Additionally, the interaction variable URP*Local has a statistically significant coefficient of −0.2763 ($p < 0.05$).

**Table 2.** The effect of tax incentives for URP on GRDP.

| Variables | Dependent Variable = Natural Logarithm of GRDP | | | |
|---|---|---|---|---|
| | Coefficient | Std. Error | Coefficient | Std. Error |
| *URP* | 0.2475 ** | 0.1130 | 0.3143 ** | 0.1260 |
| *URP* × *Local* | | | −0.2763 ** | 0.1172 |
| *FA* | 0.0703 *** | 0.0017 | 0.0615 *** | 0.0016 |
| *PAH* | −0.0094 *** | 0.0018 | −0.0029 * | 0.0017 |
| *HPI* | 0.0084 *** | 0.0005 | 0.0095 *** | 0.0005 |
| $\mu$ | included | | included | |
| *Constant* | 13.4128 *** | 0.0934 | 13.4746 *** | 0.0895 |
| Observations | 1377 | | | |
| $R^2$ | 0.8195 | | 0.7816 | |
| F-stat. | 255.71 ** | | 488.89 *** | |

Note: ***, ** and * indicate significance at the 1%, 5% and 10% levels, respectively. And variable definitions are the same as those in Equation (1).

As control variables, Fiscal Autonomy (FA) has statistically significant coefficients of 0.0703 ($p < 0.01$) and 0.0615 ($p < 0.01$), indicating that regions with higher levels of fiscal autonomy correspond to higher GRDP. In addition, both the coefficients for the ratio of aging housing (PAH) and the housing price index (HPI) are statistically significant with negative and positive signs, respectively. This means that lower ratios of aging housing and higher housing price indices are associated with higher GRDP. The results of applying the Heckman model as an endogenous analysis are similar to the results in Table 2, and the VIF of all variables to check for multicollinearity issues is less than 4.

Table 3 presents the results of an analysis of the impact of URPTAX policies on the proportion of aging housing. The findings suggest that these policies have a significant effect on reducing the portion of aging housing, particularly in non-metropolitan areas compared to metropolitan ones. The coefficients for the URP variables, which are significant at levels of −2.5459 and −2.9017, suggest that URPTAX policies result in a reduction of

aging housing proportions. In particular, the URP*Local variable shows a statistically significant coefficient of −2.5272, suggesting that URPs have a relatively greater impact in reducing the proportion of aging housing in local areas, compared to metropolitan regions.

**Table 3.** The effect of tax incentives for URP on Proportion of Aging Housing.

| Variables | Dependent Variable = Proportion of Aging Housing | | | |
|---|---|---|---|---|
| | **Coefficient** | **Std. Error** | **Coefficient** | **Std. Error** |
| *URP* | −2.5459 ** | 1.0929 | −2.9017 ** | 1.2381 |
| *URP* × *Local* | | | −2.5272 ** | 1.0458 |
| *FA* | −0.3152 *** | 0.0214 | −0.4705 *** | 0.0200 |
| *HPI* | −0.1059 *** | 0.0062 | −0.1122 *** | 0.0064 |
| *μ* | included | | - | |
| *Constant* | 36.0496 *** | 0.9463 | 42.3778 *** | 0.7453 |
| Observations | 1708 | | | |
| $R^2$ | 0.6444 | | 0.5463 | |
| F-stat. | 117.15 *** | | 204.35 *** | |

Note: *** and ** indicate significance at the 1% and 5% levels, respectively. And variable definitions are the same as those in Equation (1).

As displayed in Table 4, the analysis of the impact of URPTAX policies on fluctuations in housing prices demonstrates that URP contributes to an increase in housing prices in all regions. Nevertheless, the extent of the increase is relatively smaller in non-metropolitan areas. The URP variables have statistically significant coefficients of 0.1601 and 0.3195, respectively, signifying that housing prices increase in locations where URPs have been executed.

**Table 4.** The effect of tax incentives for URP on Housing Price Fluctuations.

| Variables | Dependent Variable = Housing Price Fluctuation | | | |
|---|---|---|---|---|
| | **Coefficient** | **Std. Error** | **Coefficient** | **Std. Error** |
| *URP* | 0.1601 * | 0.0900 | 0.3195 *** | 0.1010 |
| *URP* × *Local* | | | −0.2119 *** | 0.0523 |
| *FA* | 0.0019 | 0.0012 | 0.0025 ** | 0.0011 |
| *PAH* | −0.0003 | 0.0015 | −0.0012 | 0.0014 |
| *HPI* | −0.0053 *** | 0.0018 | −0.0081 *** | 0.0015 |
| *μ* | included | | included | |
| *Constant* | 0.4450 ** | 0.1853 | 0.7995 *** | 0.1493 |
| Observations | 1190 | | | |
| $R^2$ | 0.3130 | | 0.2849 | |
| F-stat. | 19.61 *** | | 42.67 *** | |

Note: ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively. And variable definitions are the same as those in Equations (1) and (3).

Conversely, the URP*Local variable has a statistically significant coefficient of −0.2119. This implies that in non-metropolitan regions, the extent of house price increases is relatively smaller compared to metropolitan regions. In other words, for metropolitan areas with an increased level of 0.3195, non-metropolitan areas show an effect of house price increase of only 0.1076 (=0.3195 − 0.2119), which is one-third of the magnitude of the effect observed in metropolitan areas.

Among the control variables, fiscal autonomy and house price index have statistically significant coefficients of 0.0025 and −0.0081, respectively. These coefficients suggest that regions with greater fiscal autonomy experience an increase in housing prices, while regions with higher housing price indices experience a decrease in housing prices.

### *4.2. Estimation Results of the Elasticity between Urban Regeneration-Related Tax Incentives and GRDP and the Proportion of Aging Housing*

The elasticity of GRDP with respect to tax incentives for URP shows how much GRDP changes in response to a one-unit change in tax incentives. It can be expressed as follows:

$$\varepsilon = (\Delta GRDP/\Delta Tax) \times (Tax/GRDP) \quad (4)$$

Currently, when the size of Gross Regional Domestic Product (GRDP) is denoted as GRDP and tax incentives (URPTAX) is denoted as Tax, the elasticity (ε) indicates that a 1% increase in tax incentives results in an increase in GRDP by ε. A higher elasticity of GRDP with respect to URPTAX implies that changes in GRDP are more responsive to variations in the size of tax incentives. Furthermore, the elasticity of tax incentives may vary between metropolitan and non-metropolitan regions, as a result of differences in urban development projects and GRDP size.

To demonstrate the difference in GRDP elasticity regarding tax incentives in metropolitan and non-metropolitan regions, the dependent variable is formulated as the natural logarithm of ln(GRDP). It consists of the natural logarithm of URPTAX, (ln(Tax)), the difference between urban and rural regions (Tax × Local), and control variables. Since there is a considerable contrast in the GRDP value between urban and rural regions, it is expected that the GRDP elasticities also differ. Therefore, interaction variables, especially the local variable, are introduced as dummy variables. In addition, the control variables include fiscal autonomy, the percentage of aging housing, the house price index, and a year dummy, all of which may impact GRDP.

Additionally, a fixed effect (μ) is included to control for the effect of unobserved heterogeneity in regional GRDP.

$$ln(GRDP)_{it} = \varphi_0 + \varphi_1{*}ln(Tax)_{it} + \varphi_2{*}(Tax{\times}Local)_{it} + \varphi_3{*}FA_{it} + \varphi_4{*}HAP_{it} + \varphi_5{*}HPI_{it} + \mu_{it} + \varepsilon_{it} \quad (5)$$

where

ln(GRDP): Natural logarithm of GRDP

ln(TAX): Natural logarithm of URPTAX

There are positive coefficients between the amount of URPTAX in each region and its GRDP in Figure 1. This indicates a positive economic impact attributed to URPs, with these incentives contributing to regional GRDP. Furthermore, a 1% increase in tax incentives due to such initiatives is associated with a proportional increase in GRDP, suggesting an elastic relationship.

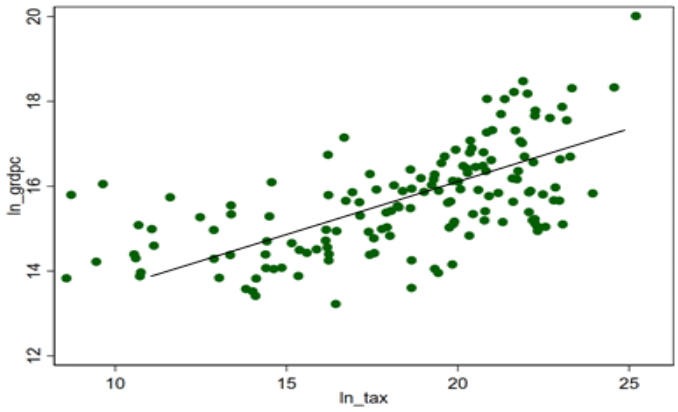


**Figure 1.** Relationship between the magnitude of urban regeneration-related tax incentives and regional GRDP.

In Table 5, the statewide GRDP elasticity is reported as 0.062. However, significant discrepancies exist between metropolitan and non-metropolitan regions, with metropolitan GRDP at 0.876% and non-metropolitan GRDP at 0.0456 (calculated as 0.0666 − 0.021). Both

ln(tax) and ln(tax)×local variables have statistically significant coefficients, which indicates their respective elasticities are statistically significant.

**Table 5.** Estimation results of GRDP elasticity for URP-related tax incentives.

| Variables | Dependent Variable = Natural Logarithm of GRDP | | | |
|---|---|---|---|---|
| | **Coefficient** | **Std. Error** | **Coefficient** | **Std. Error** |
| *ln(TAX)* | 0.0620 *** | 0.0168 | 0.0666 *** | 0.0164 |
| *ln(TAX) × Local* | | | −0.0210 *** | 0.0070 |
| *FA* | 0.0587 *** | 0.0062 | 0.0647 *** | 0.0064 |
| *PAH* | 0.0007 | 0.0058 | −0.0029 | 0.0058 |
| *HPI* | 0.0083 *** | 0.0016 | 0.0076 *** | 0.0015 |
| *μ* | included | | included | |
| *Constant* | 12.5741 *** | 0.3516 | 12.6064 *** | 0.3422 |
| Observations | 1148 | | | |
| $R^2$ | 0.7502 | | 0.7652 | |
| F-stat. | 107.37 ** | | 92.56 *** | |

Note: *** and ** indicate significance at the 1% and 5% levels, respectively. And variable definitions are the same as those in Equations (1) and (5).

The Metropolitan GRDP has a higher elasticity, with a value of 0.0876 (calculated as 0.0666 + 0.021), when compared to non-metropolitan regions. A rise in URPTAX triggers a relatively greater increase in GRDP in the metropolitan region.

It was observed that a 1% surge in tax incentives results in a 0.062% boost in the national GRDP. However, in metropolitan regions, this increase results in a 0.0876% rise in GRDP, and non-metropolitan regions witness a 0.0456% increase. Moreover, among the control variables, the share of aging housing does not exhibit statistical significance regarding regional GRDP, whereas the housing price index variable displays a statistically significant positive coefficient. This means that as the housing price index increases, so does the level of GRDP.

These findings offer proof of the feasibility of enhancing GRDP via URPTAX. However, there are concerns regarding the concentration of such effects in urban areas that could impede equitable regional growth. Additionally, disparities in the efficacy of these incentives were discovered within each urban and non-urban area. Therefore, applying URPTAX differentially in urban and non-urban areas, rather than uniformly, may be a valid option based on these findings.

Furthermore, Table 6 reveals that the elasticity of the aging housing ratio in relation to the URPTAX exhibits different signs between metropolitan and non-metropolitan areas. In non-metropolitan areas, the elasticity of the aging housing ratio is −0.0108, whereas metropolitan areas have a positive (+) elasticity of 0.0191. Overall, for every 1% increase in the URPTAX, the aging housing ratio experiences an increase of 0.0083%, whereas the proportion is larger in metropolitan areas at 0.0191%. No revision is needed.

Applying these findings to real tax incentives and a growing number of aging housing units, if the URPTAX rises by $6.9 million, with a nationwide average of 26.1869% of aging housing units in 2020 and 2021, the number of aging housing units will rise by 0.0022% nationwide, by 0.0058% in metropolitan areas, and decrease by 0.0004% in non-metropolitan areas.

The analysis indicates that the aging housing ratio does not decrease, but rather increases in response to the URPTAX elasticity. However, this study must bear in mind that the definition of aging housing requires further consideration. If this study defines it based on a 30-year standard, the number of new homes replacing those that are 30 years or older decreases. This is especially crucial in non-urban areas where a decrease in the proportion of aging housing is noted, suggesting that this trend is a result of a substantial number of new houses replacing older ones.

**Table 6.** Estimation results of Aging Housing Ratio elasticity for URP-related tax incentives.

| Variables | Dependent Variable = Natural Logarithm of Aging Housing Ratio | | | |
|---|---|---|---|---|
| | **Coefficient** | **Std. Error** | **Coefficient** | **Std. Error** |
| *ln(TAX)* | 0.0018 | 0.0079 | 0.0083 ** | 0.0039 |
| *ln(TAX)* × *Local* | | | −0.0108 *** | 0.0029 |
| *FA* | −0.0248 *** | 0.0023 | −0.0212 *** | 0.0025 |
| *HPI* | −0.0025 *** | 0.0007 | −0.0026 *** | 0.0007 |
| $\mu$ | included | | Included | |
| *Constant* | 3.7637 *** | 0.1243 | 3.6381 *** | 0.1271 |
| Observations | 1148 | | | |
| $R^2$ | 0.3761 | | 0.3963 | |
| F-stat. | 60.72 *** | | 52.77 *** | |

Note: *** and ** indicate significance at the 1% and 5% levels, respectively. And variable definitions are the same as those in Equations (1) and (5).

## 5. Conclusions and Discussion

The URPTAX policies positively impact GRDP growth in their respective regions. Nevertheless, this impact is comparably less pronounced in non-metropolitan areas. Moreover, these policies help reduce the proportion of aging housing, predominantly in non-metropolitan regions when compared to metropolitan ones. Despite generally resulting in higher housing prices, URPs cause a comparatively smaller increase in non-metropolitan regions.

The analysis of elasticity serves as a foundation for assessing the feasibility of boosting GRDP in various regions via URPTAX policies. Moreover, there exists a discrepancy in signs when gauging the elasticity of the aging housing ratio concerning said policies in metropolitan versus non-metropolitan areas. Applying the results to actual tax incentives and aging housing ratios, increasing local tax incentives related to URP nationwide by $7 million results in a 0.0022% increase in the aging housing ratio. Conversely, in non-metropolitan areas, the aging housing ratio would decrease by 0.0004%.

Several discussions are pertinent. First, an analysis is needed to address the potential decrease in GRDP improvement due to the absence of the URPTAX policy. Second, there is an uncertain limit on the amount of additional growth in GRDP that can be anticipated from the implementation of these incentives. Via URPs, various socioeconomic effects can be generated, such as local economic stimulus, business attraction and investment, and infrastructure improvement. As empirical evidence of these effects, the impact of tax incentives on GRDP, the proportion of elderly housing, and housing price fluctuation can be presented. While it may not be possible to clearly distinguish whether these effects are due to URPs or to URP tax incentives specifically, it is evident that tax incentives have a direct or indirect impact on URPs. Thus, it is crucial for future research to differentiate the influence of URPs from linked tax incentives and examine if the efficiency of URPs is dependent on the extent of these impacts.

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