

**THE EFFECT OF THE HOUSING SITE DEVELOPMENT
ON REGIONAL INCOME INEQUALITY**

By

Choi, Ha Young

THESIS

Submitted to
KDI School of Public Policy and Management
in partial fulfillment of the requirements
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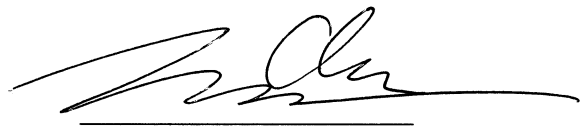
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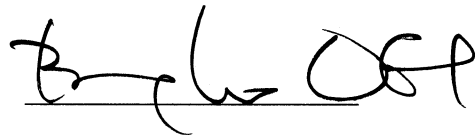
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ABSTRACT

THE EFFECT OF THE HOUSING SITE DEVELOPMENT ON REGIONAL INCOME INEQUALITY

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Massive development of housing site by the public sectors has performed the critical role in improving the housing supply in Korea since the year of 1990s and there have been various attempts to evaluate pros and cons of those public-driven housing site developments. This research is targeting to find out the association between the housing site developments and the change of income inequality at the regional level, starting with the hypothesis that the housing site developments would have negative association with the level of income inequality in a region. The statistical results, which were performed in the form of panel regressions of 3 structures between 1998~2007, shows that we cannot assert that the housing site development would not result in mitigating of income inequality. It delivers us a political implication that developing housing site may not be an appropriate tool in terms of mitigating income inequality. We should design the housing site development projects with supplementary policies which could prevent the income gaps in a region from getting wider.

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TABLE OF CONTENTS

I. INTRODUCTION	1
Housing Site Development Policy in Korea	1
Housing Site Development and Income Inequality	2
II. Literature Review.....	5
III. Methodology and Data.....	
Hypothesis to be tested	9
The Independent Variable: Volume of Construction of Housing Site Development	10
Dependent Variable: Income Inequality in a Region	13
1. Inequality Measurement: Gini Coefficient	13
2. Selection of Income Data	15
Explanatory Variables	17
Methodology	23
IV. Results.....	24
V. Concluding Remarks and Political Suggestions.....	28

LIST OF TABLES

1. The effects of Production Inducement of the 5 New Cities Development	4
2. Average Years Taken for Approvals and Constructions of the Housing Site by Public Sectors	13
3. Gini Coefficient in the Regions between 1998-2007	14
4. Temporary Employment Ratio in the Regions between 1998-2007	18
5. Unemployment Rate in the Regions between 1998-2007	19
6. Households with Senior (more than 54 years old) or Female Householders between 1998-2007	20
7. Land Price Growth Rate in Regions between 1998-2007	22
8. Results of Panel Regression over the Regions with income quintiles (Independent variable: logarithm of the housing site supplied)	25
9. Results of Panel Regression over the Regions with income quintiles (Independent variable: dummy variable of the occurrence of housing site supply)	25
10. Result of Panel Regression over the Regions without income quintiles (Independent variable: logarithm of the housing site supplied)	26
11. Result of Panel Regression over the Regions without income quintiles (Independent variable: dummy variable of the occurrence of housing site supply)	26
12. Result of Panel Regression over the Regions within income quintiles (Independent variable: logarithm of the housing site supplied)	27
13. Result of Panel Regression over the Regions within income quintiles (Independent variable: dummy variable of the occurrence of housing site supply)	27

LIST OF FIGURES

1. Housing Site Developed and Supplied by the Public Sector(km ²)	11
2. Gini Coefficient in the Regions between 1998-2007	15
3. Temporary Employment Ratio in the Regions between 1998-2007	19
4. Unemployment Rate in the Regions between 1998-2007	20
5. Households with Senior (more than 54 years old) or Female Householders between 1998-2007	21
6. Growth Rate of Regional Gross Domestic Product per Worker	21
7. Land Price Growth Rate in Regions between 1998-2007	22

I. Introduction

Housing Site Development Policy in Korea

The positive association between the rate of urbanization and increase of per capita income is one of the most obvious facts manifested in the process of economic development¹. Korea was not the exception for that rule. The rate of urbanization² in Korea drastically rose up to 82.7% in 2009 from 40.7% in 1970³ while GDP per capita from \$79 in 1960 rising up to \$17,074 in 2009.⁴ Facing a huge influx of migrations from rural areas, cities were not able to pull up the speed of enhancing their capabilities to accommodate their new citizens. They encountered the problems of unorganized land uses, skyrocketing rents, bad and illegal houses and serious traffic congestions. After a couple of oil shocks in 1970s-1980s, Korea experienced high rate of inflation together with sharp increases in rents and land prices, which became the heavy burdens particularly for the people from middle and lower classes without houses. In order to provide large quantity of houses at a time and stabilize the rents, the government announced in 1989 the plan of building 2 million houses in metropolitan and local area. That was the start of policy of public development of housing site which later became the main instrument in enacting housing policies for the past 20 years in Korea. The rate of housing provision increased from 69.8% in 1985 before the first new town development to 74.2% in 1992 after completion of development of New Towns – Bundang, Ilsan, Pyeongchon, Sanbon, Joondong in Gyeonggi Province, Doosan in Daejeon and

¹ Michael P. Todaro, Stephen C. Smith, Economic Development, Addison Wesley, 2009

² UN, <http://esa.un.org/wup2009/unup>, 2010.6 'World Urbanization Prospectus: The 2009 Revision Population Database' released by United Nations Population Division, the rate of urbanization appears as the index "Percentage urban" which is urban population as a percentage of the total population.

³ UN, <http://esa.un.org/wup2009/unup>, 2010.6

⁴ World Economic Outlook Database – October 2010, International Monetary Fund, October 6, 2010

Haeundae in Busan.⁵ Encouraged by that achievement, many of the public developments of housing site were followed all around the country and have performed a major role in supplying massive houses.

Housing Site Development and Income Inequality

Now as the country is experiencing almost zero natural population growth rate now, it is obvious that a new paradigm different from the existing massive development of housing site is required in the housing policy. In order to establish an alternative development model, it is prerequisite to evaluate pros and cons of the previous policy from the various points of view. There exist many of successful domestic previous studies about outcomes and aftermaths that the policy of public development of housing site brought in. Most of those precedent feats are about calculating and analyzing development profits, establishing the optimal development models, institutional and legal reforms, tracing social and cultural changes before and after the developments, estimating the effects of the developments in the real estate market and on the price, etc. In this research, I try to add up my contribution to those precedent studies by focusing the issue of inequality in the region with reference to housing site development. In the field of economics, we have the huge number of preeminent commitments to the issue of inequality which provide policy designers and decision makers with the useful suggestions and implications. With the help of those findings and learning from their research structures in economics, I adapted strongly quantitative approach and applied the tools into the area of housing site development.

⁵ Five new towns in Metropolitan area were planned to accommodate 1,168,000 people in 283,000 houses in the area of total 5,014 ha. Currently 11 New Towns are being developed mostly in Metropolitan area except 2 in Daejeon and Choongnam Province.

According to Bae, Kim and est.'s study (2000), they estimated the effect of production inducement of the 5 cities developed in metropolitan area – Bundang, Ilsan, Pyeongchon, Sanbon and Joongdong – up to 31 trillion Won, and the effect of employment inducement up to 1,740 thousands persons nationwide.⁶ The analysis shows that new jobs were created in the sector of construction and its relevant area where the laborers from the lower classes could enjoy the increased opportunities of jobs. But in those newly developed cities, manufacturing sectors were not able to enjoy the job creations because of the regulation that they did not allow the manufacturing facilities to enter those new cities only except apartment typed small sized factories or urban support facilities in their land use plan. Massive development of housing site enlarge the pie to be shared in regions, especially as the form of larger part for the lower classes in the sector of construction, agriculture and light manufacturing, while constant size of the part for the middle classes working in the sector of manufacturing. With those data, it is possible to expect that the gap of the income between the lower, middle and high classes got narrower, providing this research with the starting point to trace the association between the housing site development and the positive change in income inequality, even though we do not have any other previous research directly pointing to the issue of the relation between the housing site development and the change of income inequality.

⁶ 배순석, 김현식, 박상우, 김경석, 김덕례, 최희철, *Growth Control and New Town Development in the Capital Region*, 2000, Korea Research Institute for Human Settlement

Table 1. The Effects of Production Inducement of the 5 New Cities Development⁷

(Unit : 1 million Won)

	Total	Pyeongchon	Sanbon	Joongdong	Bundang	Ilsan
Food, agriculture, forestry	923,293	102,276	87,554	124,821	328,758	279,884
Mining and manufacturing	10,306,574	1,141,690	978,841	1,391,952	3,671,561	3,122,531
Electricity and gas	392,279	42,932	36,627	53,395	139,840	119,485
Construction – residential	6,650,892	861,681	807,664	842,952	2,363,630	1,774,965
Construction- non-residential	5,882,339	389,369	366,901	847,014	2,290,462	1,988,593
Construction-repair	149,999	15,375	13,325	20,506	54,346	46,448
Public utilities	1,801,452	277,686	168,839	313,427	511,400	530,100
Construction - others	677,208	104,891	48,076	42,227	189,500	292,514
Wholesalers, retailers, accommodations	1,116,886	121,230	104,205	150,823	399,769	340,861
Other service	2,734,730	295,803	249,128	380,061	972,701	837,037
Others	404,703	44,971	37,440	55,284	142,888	124,120
Total	31,040,356	3,397,902	2,898,599	4,222,462	11,064,853	9,456,538

The purpose of this research is to find empirical evidence of the association about how the development projects of housing site have changed the level of inequality over a certain period in a region. I would reserve the judge whether the level of inequality in the selected region is desirable or not. There have been enormous discussions which level of inequality is optimal for a country's economic soundness and potentiality. But it is so controversial that many of brilliant experts are still in their own stances without any absolute criteria of rule. Therefore, this research is not targeting the level of inequality itself but the change of the level over a period. I will use the result of this quantitative method not in judging whether the level of inequality got worse or better but in verifying that the virtues of public developments of housing site benefited the regional economy in terms of income

⁷ Ibid., p90

inequality. Measuring the changes in earned income inequality would reveal whether the New Town development created jobs and expanded its positive externalities in the region, or just ended in the phenomenon of separation of neighborhood.⁸ I believe this quantitative analysis and economic verification would provide the useful implication in designing the alternative model of mass urban development not only in Korea but also in other newly emerging countries, especially for sustainable regional development.

II. Literature Review

Tracing the change in the level of inequality has been the subject of empirical studies domestically and internationally for decades. Chae and Kim (2008) demonstrated that the redistribution of income does not undermine the pace of economic growth by analyzing the effect of increase in the level of income inequality measure by Gini coefficient on the economic growth of OECD countries using the Luxembourg Income Study.⁹ Yoo (2007) measured how the people recognized the level of inequality by performing the survey for the university students and obtained the result that they felt the disparities more in terms of absolute inequality¹⁰ rather than relative one¹¹. Based on that observation, his study suggested that the policy of redistribution should focus on mitigating the absolute inequality, but warned if you put too much emphasis on reducing the level of absolute inequality, you may slow down the rate of economic growth and make the people to lose their wills to work.

⁸ Arthur O'Sullivan, *Urban Economics*, Ch. 8 Neighborhood Choice, 2007

⁹ Luxembourg has released international micro data set of demographic and socio-economic variables since 1983 in order to provide unified data to be used in academic studies. They release the data every 5 years and 30 of countries were included in 2007. Chae&Kim, *Social Welfare and Economic Growth*, Korea Sociology 42 vol. 5, 2008

¹⁰ Relative income inequality is measured within the requirements of the five axioms. Gini Coefficient is one of them. 유경준, *소득불평등도와 양극화*, 2007, KDI

¹¹ Absolute income inequality is measured after mitigating one of the five axioms, income scale independence. 유경준, *소득불평등도와 양극화*, 2007, KDI

Empirical studies offer more abundant and useful implications when they deliver the analyses about how the variables consisting of income classification affect on the change of the level of inequality for a certain period. They mostly adapt the theoretical instrument of decomposing the level of inequality measured by the income sources or by the income groups. Among the studies from the field of decomposing the income inequality up to the income sources, we have Ku and Lim's (2007) demonstration that reduce of income earned by a male householder has the greatest effect on worsening the level of inequality of family income measured by Gini coefficient, while that of his spouse has an ambiguous effect. An (2004) performed the empirical comparison between the characters of an urban and a rural household's income inequality by using both of the methods of income source and income group decomposition of Generalized Entropy index. The study revealed that a rural household's income inequality got worsened, while an urban household's was stable for the same period selected. It also showed that earned income is the most important factor contributing to the level of an urban household's income inequality by more than 84%, while non-agriculture income and transferred income contribute mostly to the level of a rural household's income inequality. Kim and Chung (2010) measured how Gini coefficient changed for each income groups classified up to the household's age over a certain period and what effect the income sources have on the level of income inequality of each income groups. They obtained the result that the households with a householder aged over 40 and over 60 showed the improved level of inequality, while the income inequality of those who have householders aged over 20, 30 and 50 got worsened. Decomposition up to the income sources added the significant implication that the income inequality of households with householders aged over 20, 30, and 50 appeared worsened due to the increased inequality of earned income during the period selected which occupies the largest part of the household income for those income groups. Park, Moon and Kim (2004) measured the overall change of

income inequality for rural households, and decomposed the measured inequality by Generalized Entropy method into the income sources. They also analyzed the character of income inequality of a rural household by classifying the rural households into subordinate groups up to their householders' age and the size of farming. The result showed that agricultural income contributes most to the rural household's income inequality, and the households from the younger generation and those who have smaller size of farming have the larger income inequality than those who from the elder generation and those who have larger size of farming do. Ha (2008) studied what effects real estate income has on the overall income inequality using the method of Gini decomposition and showed that the real estate income inequality and its contribution to the overall income inequality gets larger even though the earned income is still the most important source that explains the overall income inequality.

Some of the previous studies focused on finding out the relationship between the level of inequality and the variables out of their interest of study, just as this research does. Chae (2007) performed the multiple regression so as to prove that the independent variables of unemployment rate, temporary job rate, wage ratio between large corporations and small and medium sized companies, the ratio of female householders, and the land price growth rate, could explain the change of income inequality index of Gini coefficient and Size Distribution of income for the period selected. The statistics delivered the result that unemployment rate, temporary job ratio, and wage ratio between large corporations and small and medium sized companies have significant positive correlation with the income inequality indices. The land price growth rate has significant positive correlation with the income inequality for the period when they were on the growing pattern. Oh (2008) studied what effects the national pension had on redistribution of income for the individual regions of

Korea with using Gini coefficient decomposition method. The study revealed how the income inequality with the individual regions and between the regions changed in terms of one's life income after considering the inflow of annuity from the national pension system.

Most of the studies regarding the issue of new town development in Korea were performed from the view of legal institution, development process, profit from development, and socio-economic topics with the method of comparison to the cases benchmarked and case study. Oh, Hur and Lee (2008) and many other researchers reviewed the pros and cons of development projects completed and suggested desirable model in order to develop more self-sustaining and competitive towns. Park (2005) provides useful evidence of phenomenon that new town development leads to the new classification of the residents according to their social and economic positions, which supports the clues to establish my hypotheses of this research more strongly. How to deal with development profit and sky rocketed price of real estate in the new town is another topic often touched by the development experts, including Kwon (2007).

In the field of urban economics, Ciccon and Hall (1996) proved that increasing returns to density play a crucial role for explaining the large differences in average labor productivity across U.S. states. From the understanding that labor productivity is closely related to the level of earned income, which occupies the largest part of the total income, you can get the starting point of assuming that concentration of density at one spot brought by the housing site development projects would lead to the increased disparities between the regions. But regarding the correlation between the regional growth and the level of inequality within the regions, as it is at national and international level, it is still unclear about which correlation they have. This suggests another argument to be proved in further researches that

whether there exists correlation or not at regional level.

III. Methodology and Data

Hypothesis to be tested

As mentioned in the introduction, this paper is aiming at detection of the association between the housing site development and the change in the level of income inequality. In order to trace the positive effect of the housing site development on the level of inequality in a region, the argument begins with the following hypothesis:

$$\text{Gini}_{i,t}^{12} = \alpha * \text{VC}_{i,t} + \beta * \text{UR}_{i,t} + \gamma * \text{TER}_{i,t} + \delta * \text{GRL}_{i,t} + \varepsilon * \text{HH}_{i,t} + \zeta * \text{RGR}_{i,t} + \eta * \text{Inf}_{i,t} + \theta_{i,t}$$

$$H_0: \alpha \geq 0$$

$$H_1: \alpha < 0$$

- $\text{VC}_{i,t}$: Volume of construction of housing site development projects in the region 'i' in the year 't'
- $\text{UR}_{i,t}$: Unemployment rate in the region 'i' in the year 't'
- $\text{TER}_{i,t}$: Temporary employment rate in the region 'i' in the year 't'
- $\text{GRL}_{i,t}$: Growth rate of land price in the region 'i' in the year 't'
- $\text{HH}_{i,t}$: Proportion of the households with senior householders and female householders in the region 'i' in the year 't'

¹² In order to prove the correlation between the change in the level of inequality and the volume of construction site, logarithms of the inequality levels and of the volume of construction were used in this equation.

- $RGR_{i,t}$: Regional growth rate in the region 'i' in the year 't'
- Inf_t : Inflation rate in the year 't'
- "t" : from the year of 1998 to the year of 2007 (in which you have available data from KILPS panel about income, employment, and other characters of the households surveyed)
- "i" : The individual regions by which the observations for variables are collected, managed and controlled. In this research, the regions are classified into 7 parts concomitantly to the classification of the national land in the Grand National Land Plan; Seoul, Gyeonggi, Incheon, ChungCheong(Daejeon, Chungbuk, Chungnam,), Dongnam(Busan, Ulsan, Gyeongnam), Daegyeong(Daegu, Gyeongbuk) and Honam(Gwangju, Jeonbuk, Jeonnam). They have Gangwon and Jeju also in their classification, which were excluded in this research for the reason of lack of observations in those regions.¹³

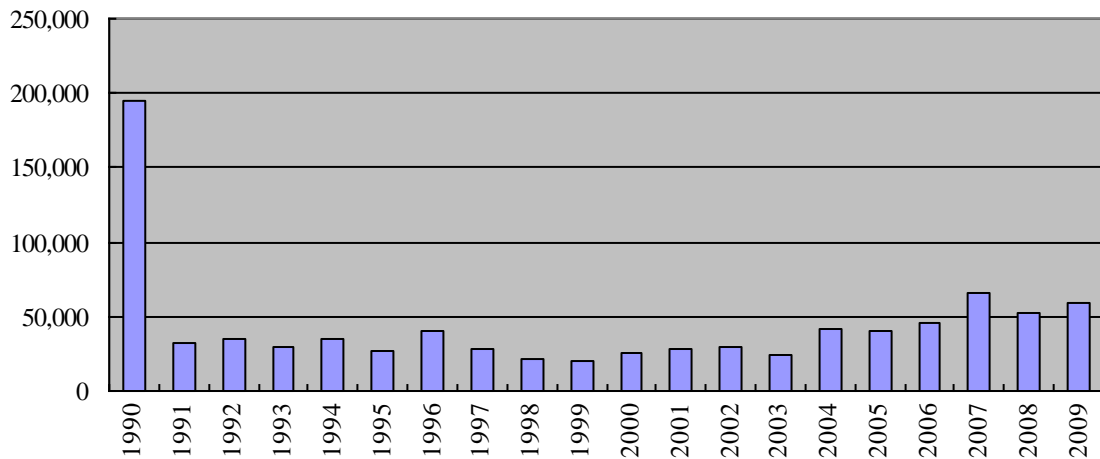
The Independent Variable: Volume of Construction of Housing Site Development

Housing sites in Korea are developed by both of the private sectors and public sectors. Public sectors develop the housing site based on the law of 'Housing Site Development Promotion Act (HSDPA)', 'Urban Development Act (UDA)', 'Act on the Maintenance and Improvement of Urban Areas and Dwelling Conditions for Residents (AMIUDR)', and other special laws that regulate the construction of the innovative cities, free economic zones, and

¹³ The alternatives for segmentation of the observations could be at the individual administrative regional level, or at the broader level. The former segmentation has the limitation in terms that it has too small number of observations in the individual segmentations; while the latter imposes the question about to which boundary the segmentation should be defined. Therefore, the segmentation by the Grand National Land Plan could be the most accountable choice as it is the base on which the regional and national economic development plans are considered.

administrative complex city. Private sectors usually develop the fallow land in the Quasi-Agricultural Zone and the Urban Zone, or redevelop the existing worn out residential buildings. According to Oh(2008), public developments of housing site contributed by 43% to the total supply of housing stock while private projects by 57% between 1995-2005.¹⁴ Among the housing site developed by the public sectors, 299,151km² was developed by HSDPA and other laws, while 9.774km² by UDA and 95.48km²¹⁵ by AMIUDR between year 2002-2007.¹⁶

Figure 1. Housing Site Developed and Supplied by the Public Sectors (km²)
(Source: Ministry of Land, Transport and Marine Affairs)



In this research, excluding the housing site developed by the private sectors due to lack of available data, the housing site developed and supplied by the public sectors based on the

¹⁴ 오향화, *A Study on the Participation of Private Sectors in Public Land Development Program, 2008*, Jeonbuk National University

¹⁵ This number is of the area where the housing redevelopment projects were completed. AMIUDR also regulates the projects of improving dwelling conditions, the projects of housing reconstructions, and the projects of enhancing urban environment. We do not have any empirical data about the volume of construction for those three other type of projects, so they are excluded from this selection of data.

¹⁶ Statistical Charts, Ministry of Land, Transport and Marine Affairs

HSDPA, UDA, AMIUDR and other special acts was used as an independent variable for the analysis. There could be various measurements showing the magnitude of the newly developed housing site such as the number of inhabitants, jobs, companies located in the town, and schools. Even though the number of population (or inhabitants) is the strongest indicator showing the economic dynamism of the newly developed housing site, the volume of construction site replace the population indicator, for the reason that it is the only data available from the credible sources¹⁷, and it may reflect indirectly the level of population considering that the volume of construction of housing site is generally planned reflecting the number of population to live in. Volume of the housing site supplied by the public sectors by HSDPA, UDA, AMIUDR, and other development related acts was obtained and used in this research.

The research by Oh (2007) released that it takes 72 months from setting the plan for the development to completing the development based on HSDPA by average between the years of 2000-2005. Considering that HSDPA regulates that you must set and hand in the Development Plan within 2 years of the area designation, and the Enactment Plan within 3 years, total in 5 years at most (60 months), you can find that it spends most of the time in approvals for the projects. According to the flow chart of the Housing Site Development by HSDPA, supply of the site is performed right after the approval of the Enactment Plan, at the end of the process of the approval (at least 12 months before the completion). Assuming that the similar time consumption is applied to the other public housing site developments performed by the acts of UDA and AMIUDR, in order to reflect that time lag effect between the supply of the housing site and inhabitation's moving-in, the volume of construction site supplied in 2 years earlier (t-2) would apply to the dependent variables and explanatory

¹⁷ You can obtain the data about urban and real estate issues from <http://www.onnara.go.kr/>.

variables in year t.

Table 2. Average Years Taken for Approvals and Constructions of the Housing Site by Public Sectors¹⁸

Year	2000	2001	2002	2003	2004	2005
Months	85	89	65	69	62	64

Dependent Variable: Income Inequality in a Region

1. Inequality Measurement : Gini Coefficient

We have various methods of measuring the inequality such as variance, logarithmic variance, variance of logarithms, Generalized Entropy Class, the Atkinson Class and Gini Coefficient.¹⁹ According to Cowell (1995) and Litchfield (1999), the five axioms provide the ground for choice of method of measuring inequality. The first axiom is the Pigou-Dalton Transfer Principle that requires “inequality measure to rise (or at least not fall) in response to a mean-preserving spread.” It means that if an income transfers from a poorer person to a richer person, it should increase the income inequality or vice versa. The logarithmic variance and the variance of logarithms do not satisfy this axiom. The second axiom is Income Scale Independence which means the inequality level should stay the same when the each individual income increases or decreases by the same proportion ($\lambda > 0, I(y) = I(\lambda * y)$). Variance fails to comply with this axiom. The third axiom is the Principle of Population that inequality should be constant when you merge the two identical distributions. The fourth axiom is the Anonymity, which means the inequality should be independent of any characteristic of

¹⁸ 오향화, *A Study on the Participation of Private Sectors in Public Land Development Program, 2008*, Jeonbuk National University

¹⁹ Julie A. Litchfield, *Inequality : Methods and Tools*, 1999, World Bank

individuals other than their income. The final axiom is Decomposability that requires the overall inequality should be constituent with the inequality of the sub-groups of the distribution. Generalized Entropy Class of measures are easily decomposed into components of within-group inequality and between-group inequality ($I_{total}=I_{within}+I_{between}$). Atkinson measures are also decomposable into within and between group inequalities, but within and between groups inequalities do not necessarily sum up to the overall inequality ($I_{total}\neq I_{within}+I_{between}$). Gini coefficient is only decomposable when the partitions do not overlap with one another (Litchfield, 1999). In this research, Gini coefficient was used as a measurement of the income inequality for its simplicity and easy interpretation. Gini coefficient has values between 0 and 1, perfect inequality and perfect equality respectively. You can see the formula for Gini coefficient as follows:

$$Gini = \frac{1}{2 n^2 y} \sum_{i=1}^n \sum_{j=1}^n |y_i - y_j|$$

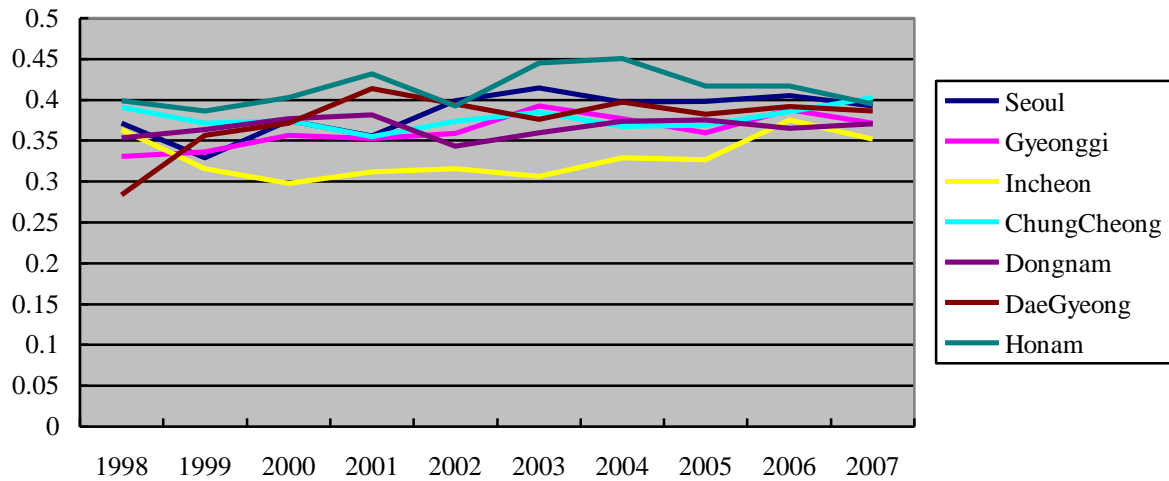
Table 3. Gini Coefficient in the Regions between 1998-2007

(Source of Income Data : KLIPS)

Year/Region	Seoul	Gyeonggi	Incheon	ChungCheong	Dongnam	DaeGyeong	Honam
1998	0.3711	0.331	0.364	0.3907	0.3537	0.2835	0.3991
1999	0.3294	0.3361	0.3159	0.3718	0.3633	0.3569	0.3861
2000	0.3749	0.3564	0.2975	0.3748	0.3767	0.3718	0.4028
2001	0.3556	0.353	0.3121	0.3548	0.3818	0.4136	0.4316
2002	0.3986	0.3592	0.3162	0.3737	0.3429	0.3947	0.3929
2003	0.4149	0.3928	0.3064	0.3846	0.3601	0.376	0.4454
2004	0.3973	0.3771	0.3292	0.3673	0.3741	0.3972	0.4509
2005	0.3981	0.3601	0.3271	0.3694	0.3755	0.3822	0.4171
2006	0.4051	0.3876	0.3754	0.3855	0.3652	0.3916	0.4171
2007	0.3929	0.3715	0.352	0.4026	0.3703	0.386	0.3948

Figure 2. Gini Coefficient in the Regions between 1998-2007

(Source of Income Data: KLIPS)



2. Selection of Income Data

We have public income data in Korea such as ‘Urban Family Budget Survey’, ‘Family Consumption Survey’ and ‘Family Budget Survey’ surveyed and released by National Statistical Office. We have another data organized by a private institution, called as ‘KLIPS (Korea Labor Institute Panel Survey)’ surveyed and released by Korea Labor Institute. ‘Urban Family Budget Survey’ has been released since 1980 for the population of urban families with 2 and more members excluding the rural inhabitant, single, self-employed, and unemployed families. Due to its exclusion of the population, this survey tends to underestimate the level of inequality or poverty.²⁰ ‘Family Consumption Survey’ was conducted on non-periodic basis covering all of the families’ income only except the rural families. ‘Family Budget Survey’ has been conducted since 2003 so as to cover all of the families over the country including the single, rural and unemployed families targeting 100%

²⁰ 유경준, 소득불평등도와 양극화, 2007, KDI

of population to be surveyed. ‘KILPS’ was conducted on 5,000 urban families selected from individual Metropolitan City and Provinces and their family members. It is the panel data repeating the same survey for the same population so as to provide time-series as well as cross-sectional data. It is believed to have unique strength in controlling the unobservable individual effects by tracing the change of decision-making patterns of the individual and the families up to the change of policy of the lapse of time.²¹ But it is also criticized that it has the larger measurement error than other surveys²² and possibly brings the result of overestimated or underestimated inequality. This research was conducted with KLIPS household income data despite its shortcomings for the reason that KLIPS is the only material in Korea providing the income data not at national but at regional level. And more importantly, as I mentioned in the introduction, the aim of this research is not to judge whether the inequality is at its desirable level but to find out the dynamic relationship between the change of inequality and the housing site development projects. It means overestimation or underestimation of inequality caused by the character of the data does not undermine the ground for this research significantly. The KLIPS household income data consists of earned income, financial income (interest from banks or bonds, dividends, trading profits of stocks, etc.), real estate income (rent of houses and lands, trading profits of real estate, etc.), transferred income (social insurance and other subsidies), and other income (insurance, retiring allowance, prize money of lottery, inheritance and endowment). This research covers the change in inequality of sum of earned income, financial income and real estate income, and excluded transferred income and other income in order to measure the change in income inequality only caused by producing activities, eliminating the effect of social welfare policies. The earned income is the largest part of the household income and its

²¹ KLIPS User’s Guide

²² 유경준, 소득불평등도와 양극화, 2007, KDI

occupying ratio have become higher since the mid of 1990s.²³ We have 11 waves of KLIPS income data between 1998~2008 but this research picked the data in the period of 1998 – 2007 because the data delivers the respondents' record of income for the previous year.

Explanatory Variables

According to Danziger and Gottschalk (1995), we have four factors affecting the change in income inequality : (1) the change in labor supply such as inflow of new comers in the labor market, (2) the change in the labor demand as a result of the shrinkage of manufacturing industry or globalization of the capital market, (3) the change in the public policy including social welfare program, the level of minimum wage, and taxation, (4) instability of earnings due to intensified competition and flexibility in the labor market.²⁴ Chae (2007) suggested that the factors that could affect the change of income inequality in Korea are economic fluctuation, intensified flexibility of employment, demographic changes with the increasing number of female and senior householders, and growth of real estate price. With the help of those previous studies, 6 explanatory variables were used in order to control the correlation between the inequality level and the construction site: unemployment rate, ratio of temporary employment to total, the proportion of households with senior or female householders, land price growth rate, regional growth rate and inflation rate. Except inflation rate, all of data for those explanatory variables were collected at regional level concomitant to the data of income inequality and the volume of construction of housing site. For the purpose of enhance the accountability of the relationship between the explanatory variables and the

²³ 김미곤·여유진·김태완·양시현·최현수, 빈곤과 불평등의 동향 및 요인 분해, 한국보건사회연구원, 2005

²⁴ Chai, Goo-Mook , *An Analysis of the Conditions and Causes of Income Inequality: Focusing on the Urban Worker Households*, 2007, Korean Journal of Social Welfare, Vol. 59, No. 1, 2007. 2, pp. 199-221

dependent variable of income inequality, unemployment rate, temporary employment rate and the proportion of households with senior or female householders were calculated from KILPS data. Land price growth data, regional growth rate and inflation rate were obtained from National Statistical Office data.

Table 4. Temporary Employment Ratio in the Regions between 1998-2007²⁵

	Seoul	Gyeonggi	Incheon	ChungCheong	Dongnam	DaeGyeong	Honam
1998	17.48%	17.76%	19.31%	19.18%	17.60%	23.63%	20.90%
1999	26.34%	24.24%	28.90%	27.68%	25.98%	29.09%	24.53%
2000	22.91%	20.47%	23.01%	24.56%	24.44%	26.49%	22.30%
2001	24.06%	18.82%	18.30%	23.13%	24.27%	24.24%	18.89%
2002	23.86%	19.84%	14.74%	21.22%	24.54%	25.96%	20.62%
2003	21.91%	18.05%	14.56%	24.40%	23.11%	23.39%	20.16%
2004	23.73%	19.43%	18.06%	24.70%	22.40%	23.65%	23.42%
2005	22.19%	19.64%	17.05%	23.17%	24.68%	25.06%	23.51%
2006	23.65%	19.33%	15.63%	25.68%	24.29%	20.67%	22.35%
2007	20.90%	20.34%	18.71%	25.88%	23.26%	19.96%	24.46%

²⁵ Source of income data: KLIPS (Proportion of the respondents those who were in the temporary and daily employment to the total respondents those who were in the permanent status)

Figure 3. Temporary Employment Ratio in the Regions between 1998-2007

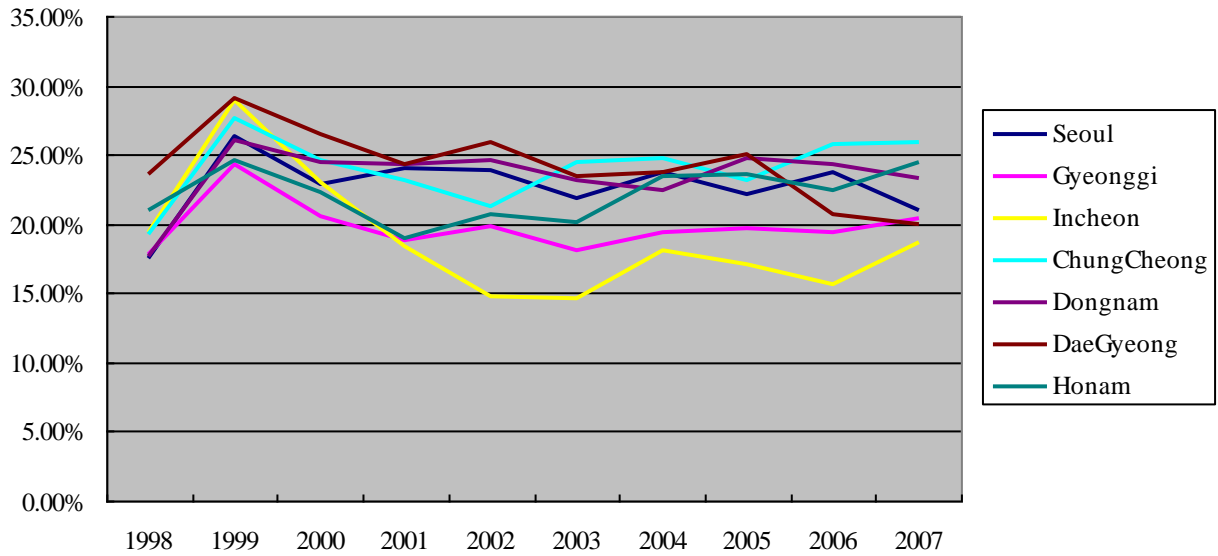


Table 5. Unemployment Rate in the Regions between 1998-2007²⁶

	Seoul	Gyeonggi	Incheon	ChungCheong	Dongnam	DaeGyeong	Honam
1998	9.42%	8.39%	8.60%	5.74%	7.52%	7.12%	5.01%
1999	3.85%	3.27%	2.84%	2.27%	4.14%	3.13%	2.36%
2000	1.63%	1.18%	1.11%	1.68%	2.69%	1.90%	1.41%
2001	1.82%	1.25%	0.59%	0.62%	1.62%	1.35%	1.07%
2002	1.46%	1.45%	0.74%	1.90%	1.52%	1.36%	0.95%
2003	2.04%	2.51%	2.00%	1.25%	1.70%	2.49%	1.33%
2004	1.24%	2.21%	0.81%	2.13%	2.45%	2.58%	1.87%
2005	1.60%	1.63%	2.75%	2.22%	2.17%	2.33%	0.56%
2006	2.02%	1.85%	1.73%	1.96%	1.45%	2.47%	1.20%
2007	1.49%	1.48%	1.36%	1.71%	1.12%	0.75%	0.91%

²⁶ Those rates were calculated with the employment data of KLIPS, which could be different from the ones released officially in the national statistics. Those differences were ignored for this research so as to enhance the accountability of explanatory variables for the dependent variable (income inequality) by using the data from the same source. Those rates were obtained by dividing the number of respondents who said they were looking for the jobs or were temporarily unemployed to the total number of respondents who said they were not employed, after excluding the number of respondents of students, housewives, and seniors.

Figure 4. Unemployment Rate in the Regions between 1998-2007

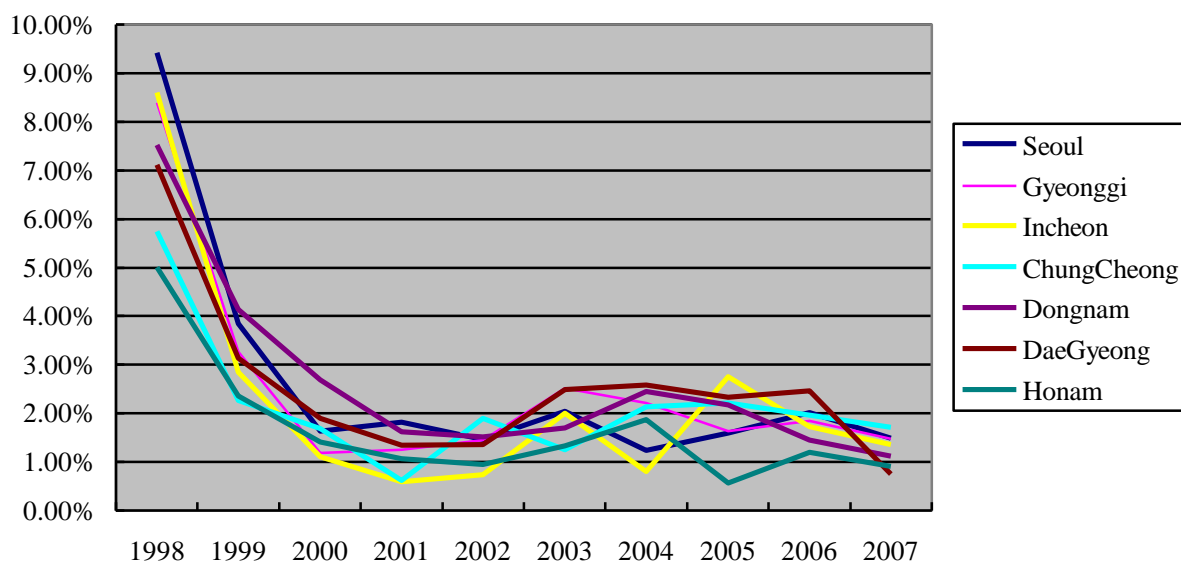


Table 6. Households with Senior (more than 54 years old) or Female Householders between 1998-2007²⁷

	Seoul	Gyeonggi	Incheon	ChungCheong	Dongnam	DaeGyeong	Honam
1998	33.58%	28.19%	31.99%	36.02%	35.43%	40.51%	42.56%
1999	35.07%	30.54%	34.50%	39.22%	37.62%	42.83%	47.14%
2000	37.40%	32.53%	33.73%	41.14%	37.44%	44.14%	48.28%
2001	37.61%	32.93%	39.00%	40.33%	38.36%	44.66%	47.95%
2002	40.50%	34.77%	38.55%	41.87%	39.95%	46.35%	49.79%
2003	42.93%	37.70%	38.43%	43.72%	43.13%	48.45%	50.52%
2004	43.29%	36.64%	38.80%	43.75%	43.50%	48.87%	52.98%
2005	45.93%	37.86%	40.27%	44.26%	45.18%	51.09%	55.18%
2006	47.02%	39.28%	41.97%	44.94%	46.81%	49.74%	56.03%
2007	50.05%	41.15%	44.30%	48.43%	47.71%	49.40%	56.77%

²⁷ Those proportions were calculated with the data about households of KLIPS.

Figure 5. Households with Senior (more than 54 years old) or Female Householders
between 1998-2007

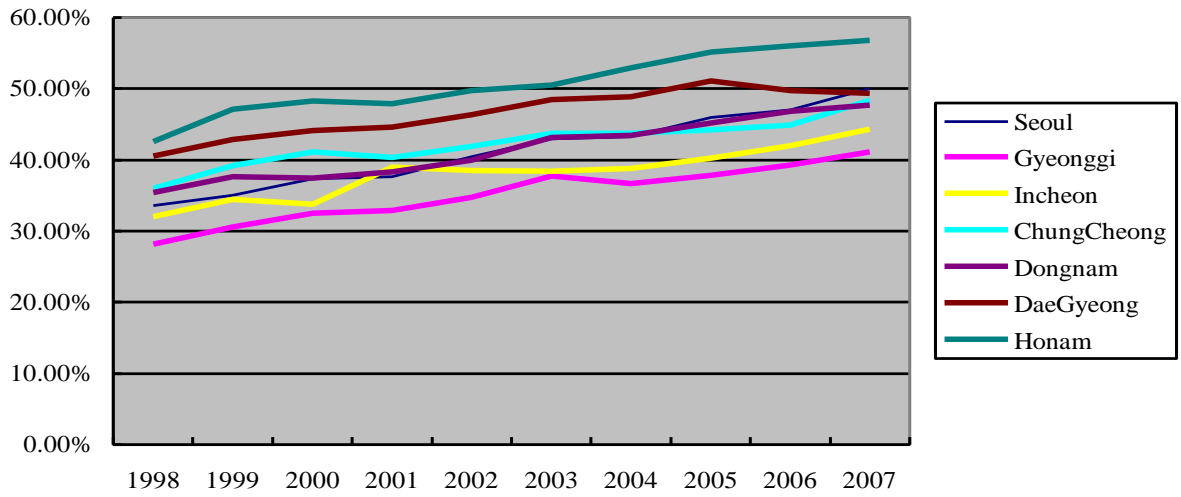


Figure 6. Growth Rate of Regional Gross Domestic Product per Worker
(Source of Regional Gross Domestic and Economically Actively Population:
National Statistical Office)

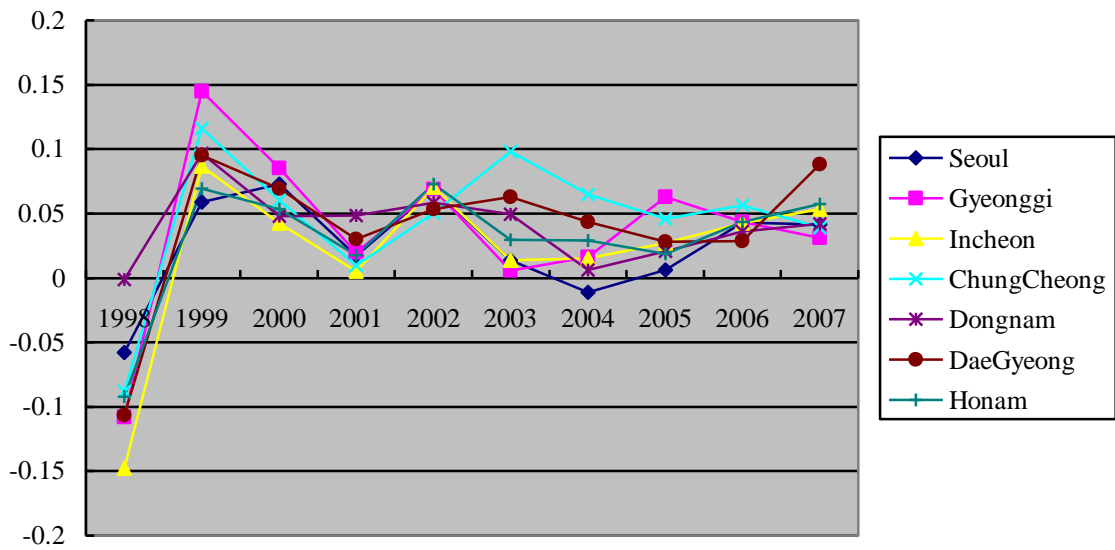
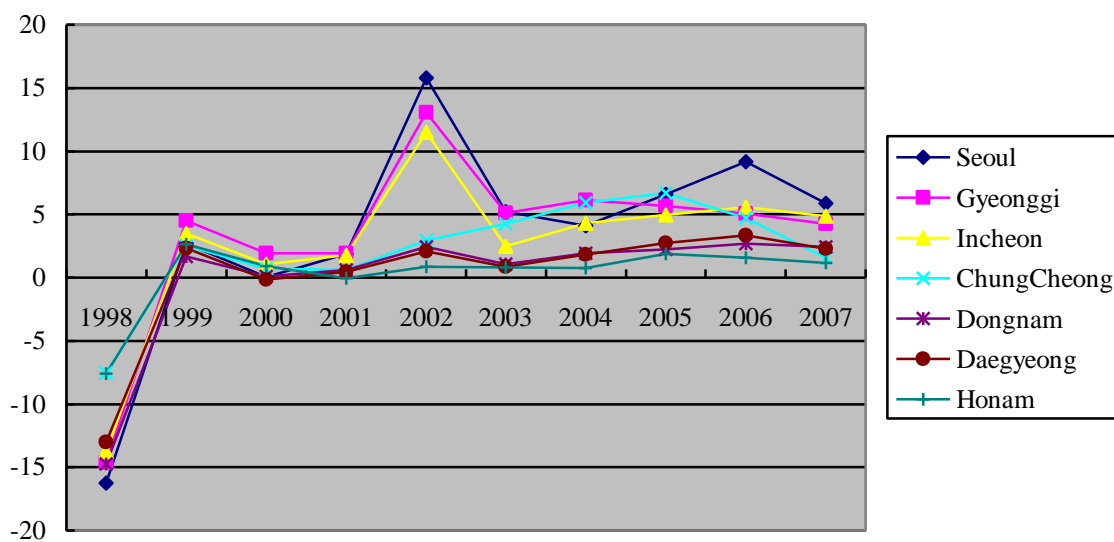


Table 7. Land Price Growth Rate in Regions between 1998-2007²⁸

	Seoul	Gyeonggi	Incheon	ChungCheong	Dongnam	Daegyeong	Honam
1998	-16.25%	-14.65%	-13.79%	-7.53%	-14.73%	-13.00%	-7.60%
1999	2.66%	4.52%	3.51%	2.55%	1.65%	2.33%	2.66%
2000	0.05%	1.92%	1.07%	0.69%	0.12%	-0.17%	0.92%
2001	1.89%	1.91%	1.77%	0.59%	0.60%	0.47%	-0.05%
2002	15.81%	13.06%	11.51%	2.91%	2.42%	2.08%	0.87%
2003	5.23%	5.12%	2.50%	4.27%	1.04%	0.85%	0.79%
2004	4.09%	6.12%	4.32%	5.91%	1.92%	1.85%	0.77%
2005	6.56%	5.69%	4.94%	6.70%	2.24%	2.76%	1.90%
2006	9.17%	5.07%	5.58%	4.69%	2.66%	3.35%	1.55%
2007	5.88%	4.23%	4.85%	1.59%	2.43%	2.30%	1.15%

Figure 7. Land Price Growth Rate in Regions between 1998-2007



²⁸ Ministry of Land, Transportation and Marine Affairs (www. Onnara.go.kr)

Methodology

The panel regression model introduced in the previous section was tried by the following three methods, respectively for the two kinds of independent variables, one of which is logarithm of volume of housing site supplied, and the other of which is the dummy variables (0, 1) of housing site supplied indicating whether there was the volume of housing site supplied or not in a region in a certain year. Two kinds of variables were devised so as to find out the association between the numeric volume of housing site and the income inequality level, and that between the occurrence of the event of housing site development and the income inequality.

(1) Regression over the regions without income quintiles

It is to trace the positive association between the change of income inequality in a region and the change of volume of housing site supplied in the same region. You have 70 observations for the variables in the panel with 7 regions over 10 years. From this model, you can obtain the information about by which the supply of housing site has the overall effect on the change of income inequality level.

(2) Regression over the regions with income quintiles

It is to trace the positive association between the change of income inequality in an income quintile in a region and the change of volume of housing site supplied in the same region. You have 350 observations for the variables in the panel with 5 income quintiles in 7 regions over 10 years. From this model, you can obtain the information about that how the overall effect of the supply of housing site on the change of

income inequality level is divided for each income groups, separating the between group effects of each income groups from the within group effects of those groups.

(3) Regression over the regions within income quintiles

It is to trace the positive association between the change of income inequality in an income quintile and the change of volume of housing site supplied in a region. You have 70 observations for the variables in the panel with 7 regions over 10 years with which you perform 5 times regression for each income quintile groups. This is to see whether the supply of new housing site has the different effect on the change of income inequality depending on the income levels.

IV. Results

As a result of using the fixed-effect, between-effect and random-effect panel regression models, the statistical results reveals that you cannot see any significant indicators which reject the null hypothesis that the supply of housing site is positively associated with the increase of income inequality in a region. The statistical results from the methodology of panel regression over the regions with income quintiles show that you do not have any significant positive correlation coefficient between the volume of housing site supplied and the change of the level of income inequality at 0.1 confidence level. You also have the same results when you apply the dummy variable of occurrence of the housing site supply in the independent variable.

Table 8. Result of Panel Regression over the Regions with income quintiles

(Independent variable: logarithm of the housing site supplied)

Variable	BE_model	FE_model ²⁹	RE_model ³⁰
Logarithm of housing site	-0.036	0.028	0.016
Regional unemployment rate	1.198	-0.777	0.485
Regional temporary employment rate	-0.778	-2.011***	-1.811***
Regional growth rate	-0.500	0.320	0.638
Senior or female householders	1.615	3.333***	3.080***
Land price growth rate	0.005	0.007	-0.003
Inflation	-0.002	0.000	0.019

Legend: * p<0.1, **p<0.05, ***p<0.01

Table 9. Result of Panel Regression over the Regions with income quintiles

(Independent variable: dummy variable of the occurrence of housing site supply)

Variable	BE_model	FE_model	RE_model
Dummy variable of housing site supplied	0.043	0.009	0.026
Regional unemployment rate	0.088	-0.803	0.549
Regional temporary employment rate	-0.100	-1.973***	-1.809***
Regional growth rate	-0.698	0.588	0.652
Senior or female householders	1.510	3.302***	3.075***
Land price growth rate	0.004	0.007	-0.003
Inflation	0.003	0.000	0.018

Legend: * p<0.1, **p<0.05, ***p<0.01

²⁹ Fixed-effects regression assumes that the residual u_i is a parameter to be estimated in the linear regression model of $y_{it}=\alpha+\beta_{it}+u_i+e_{it}$. Min&Choi, *STATA Panel Data Analysis*, 2010

³⁰ Random-effect GLS regression assumes that the residual u_i is a random variable in the linear regression model of $y_{it}=\alpha+\beta_{it}+u_i+e_{it}$. Min&Choi, *STATA Panel Data Analysis*, 2010

Performing the panel regression model over the regions without income quintiles has the statistical results that fail to reject the null hypothesis without any significant correlation coefficient at 0.1 confidence level, for the both cases where you respectively apply logarithm of the volume of housing site supplied and dummy variables of occurrence of housing site supply into the independent variable.

Table 10. Result of Panel Regression over the Regions without income quintiles
(Independent variable: logarithm of the housing site supplied)

Variable	BE_model	FE_model	RE_model
Logarithm of housing site	0.015	0.012	0.006
Regional unemployment rate	-1.211	2.679*	0.649
Regional temporary employment rate	-0.452	0.102	0.262
Regional growth rate	-0.731	0.119	0.204
Senior or female householders	0.327	1.272***	0.975***
Land price growth rate	0.001	0.009**	0.004
Inflation	-0.011	0.000	0.019

Legend: * p<0.1, **p<0.05, ***p<0.01

Table 11. Result of Panel Regression over the Regions without income quintiles
(Independent variable: dummy variable of the occurrence of housing site supply)

Variable	BE_model	FE_model	RE_model
Dummy variable of housing site supplied	0.006	0.029	0.030
Regional unemployment rate	-0.778	2.395	0.763
Regional temporary employment rate	-0.484	0.080	0.187
Regional growth rate	-0.526	0.150	0.148
Senior or female householders	0.500	1.178***	0.979***
Land price growth rate	0.001	0.008*	0.004
Inflation	-0.009	0.000	0.016

Legend: * p<0.1, **p<0.05, ***p<0.01

The final methodology of the panel regression over the regions within income quintiles also failed to reject the null hypothesis without showing any significant correlation coefficient between the logarithm of the volume of housing site supplied and the change of income inequality, and that between the occurrence of housing site supply and the change of income inequality, respectively.

Table 12. Result of Panel Regression over the Regions within income quintiles
(Independent variable: logarithm of the housing site supplied)

Variable : Logarithm of housing site	BE_model	FE_model	RE_model
1 st Quintile	0.022	0.009	0.009
2 nd Quintile	-0.061	0.026	0.029*
3 rd Quintile	0.471	-0.005	0.009
4 th Quintile	-0.034	-0.019	-0.018
5 th Quintile	0.110	0.009	0.011

Legend: * p<0.1, **p<0.05, ***p<0.01

Table 13. Result of Panel Regression over the Regions within income quintiles
(Independent variable: dummy variable of the occurrence of housing site supply)

Variable : Logarithm of housing site	BE_model	FE_model	RE_model
1 st Quintile	0.165	-0.001	0.005
2 nd Quintile	-0.081	-0.049	-0.046
3 rd Quintile	-0.132	-0.034	-0.045
4 th Quintile	-0.363	0.020	0.022
5 th Quintile	0.227	0.095	0.087

Legend: * p<0.1, **p<0.05, ***p<0.01

V. Concluding Remarks and Political Suggestions

The statistical results do not reject the null hypothesis introduced in the first part of this research so that we cannot assert that the housing site development mitigate the level of income inequality in the region. But neither are we able to assert that developing housing site worsen the level of income inequality in a region with those statistical results but should reserve the judgment about the direction toward which the level of income inequality moves according to the development of housing site. It delivers different implication from the expectation that development of housing site would create the jobs for the lower classes those who are engaged in the low-skilled laboring industry, with not having any influence on the jobs for the middle classes those who mainly work in the manufacturing sector, ultimately narrowing the gap between the income classes. Those statistical results have the implication that the policy of developing massive housing site probably may not be the appropriate tool in achieving mitigation of income inequality in a certain region or for a certain group of income classes. It delivers an important and meaningful political hint that when we newly plan the massive housing site development, we should not look over the issue of inequality in the region where those projects are taken and should combine the policies relevant to income inequality mitigation with the massive housing site development policy, in order to prevent the income gap from becoming wider in a region. We should make the employment inducement effect and production inducement effect from the housing site development projects to be spread out over the region. The complementary policies for doing that include planning the new housing site with stronger manufacturing functions that could add income sources for the lower and middle income classes, social welfare policies especially for the lower income classes residing in newly developed housing site, and offering the special treatment for those who do not have stable housing statute from the lowest class when

providing the housing units in the newly developed housing site.

As I mentioned in the methodology and data section, this research keeps an inborn shortcomings of KLIPS data such as potential overestimation or underestimation of the level of inequality and the temporary job ratio to the total employment. The small number of observations for a certain regions imposes another restrictions on the analysis of the income inequality to be used in the panel multiple regression model. Finding out whether the income inequality does not have any association with development of housing site, or has negative correlation is the area left beyond the analysis of this research, which would have greater political implication in designing the housing policy. Finally, the models tried in this research are based on the static analytical frame composed of the artificially segmented regions, ignoring the dynamic movement of the people over the administrative regions before and after the developments. If that ignorance could be fixed, you would get the results with stronger significance and accuracy.

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