

A Theoretical Model Analysis of Urban Transformation after Global Financial Crisis 2008¹

Hiroshige TANAKA

Faculty of Economics, Chuo University, Japan

Higashinakano 742-1, Hachioji-city, Tokyo 192-0393, Japan

Abstract

The residential environment and quality of buildings in cities are influenced by the mechanism of productions. In some historical perspectives, the alternations of leading industries have destined the growth among the regions. The globalization is not only expected to enlarge transboundary exchange of goods, services and money but also more probable to appear the alternation in the sites of production commonly all over the world. As multinational corporations increase movements among the production sites, the relations among global cities might be transformed into more interdependent or unstable structures.

Tanaka(1994) demonstrates that the Hotelling and Downs approach could be applicable as an appropriate theory to explain urban quality construction in the Japanese bubble economies and the lost decade from the 1980s to early the 1990s. In the recent decades the growing net works in globalized economies have strengthened the uniformity and interdependence of global cities. Although the previous paper considers the social welfare and market structure in the particular city, this paper argues that the previous approach could develop into an efficient analytical method to investigate connections of global cities in both economic and social aspects. Adapting the general equilibrium analysis on the cities that compromise the global net work, we clarify the competitive and cooperative characteristic of the total structure in the global city system. The theoretical investigations are demonstrated by the statistical analysis on the large urban structural change after the world financial crisis 2008 in the Greater Tokyo Area.

¹ This paper is the English version of Tanaka (2013).

Keywords

Global Cities, Multinational Corporations, Hotelling and Downs approach, Urban Structural Change after the financial crisis 2008, the Greater Tokyo Area

1.Introduction

The globalization of economies since the 1990s has expanded scales of financial assets and facilitated many corporations to procure the funds for developing overseas productions and sales. Many multinational corporations more freely enter into the global markets and seek for the advantageous locations in the global competition. In particular, the relatively low production cost is a prominent target in the competition. To achieve effective production the multinational corporations could construct the network beyond the borders of nations. To be attractive for individual consumers the globalization tends to accelerate cooperation between the multinational corporation and some regions at the same time. Some multinational corporations are tempted to obtain many production sites and to decide transfer of sites in productions and sales according to cost and profit relations at the short term. As the global markets grows, various combinations of sites could be available from the production to consumption and the best selections of sites for multinational corporations are more vulnerable or sensitive for the external changes in global economies.

The residential environment and quality of buildings in cities are influenced by the mechanism of productions. In some historical perspectives, the alternations of leading industries have destined the growth among the regions. The globalization is not only expected to enlarge transboundary exchange of goods, services and money but also more probable to appear the alternation in the sites of production commonly all over the world. As multinational corporations increase movements among the production sites, the relations and structures between global cities might be transformed into more interdependent or unstable. Some researchers of the regional science focus intensively on the connected relations among major cities improved by the globalized economies. Friedmann(1986) initiates the approach for the transformation of cities based on the world city hypothesis. Kriff (1987) arranges the concept from the analytical view. Many authors discuss the relation between global economies and the network of global cities².

The expanded global activities fluctuates business cycles further by the intertwined causes. Tanaka (2009) considers that globalized economies become more unstable by the

² This subject is recognized recently but attracts intellectual attention of many researchers such as Alderson.A.S.and J. Beckfield(2007), Kennedy,C.(2011), Taylor,P.J.(2001), Short,J.R.(2004).

reason of the growing conflicts between multinational corporation and world spread stakeholders. The global market and government failures caused by the conflicts are expected to change the scenery or the situation of cities by the large range. Tanaka (2011) makes clear that regions seek sustainability cooperatively with many stakeholders and that the regions pursue efficient policies in global competition and network effects of cities. In some cases, the regions take advantageous tax system or deregulation to induce investments from overseas. Increasing demand of global economies could make some regions to be prosperous in the synaptic global network. But declining processes of demands influence on so many regional communities as well as markets swiftly in another direction. For example, the slowdown of world economies in 2009 decreased the demand of office in global cities such as New York, London, Paris simultaneously. A large amount of empty offices was expected to deteriorate a large scale of business buildings. Actually, the high grade offices that had been declined in demand have been restructured to accommodate the popular demand. In many cases the alternations of offices have tended to accompany decrease of prices and qualities in the regional buildings. Since the synthetic network effects in the global economies are enlarged, we should challenge to make clear and to control the mechanism of the fluctuation of economies which is conveyed into the prosperity and decline throughout the region. This paper presents a model analysis to overview the connected mechanism of the society and the economy in the global cities.

Downs(1972) approaches on the theory of political parties by employing the competitive analysis of the spatial theory of Hotelling(1929). Downs presents a preference index by treating political parties as the suppliers in the markets. Tanaka (1994) notices that distributions of the preference over the building quality are key factor to determine environment of living. Tanaka(1994) demonstrates that the Hotelling and Downs approach could be applicable as an appropriate theory to explain urban quality construction in the Japanese bubble economies of from the 1980s to the early 1990s. The net work in globalized economies strengthens the uniformity and interdependence of global cities. Although the previous paper considers the social welfare and market structure in the single city, this paper argues that the previous approach could develop into a useful analytical method to investigate connection of global cities in both economic and social aspects. Adapting the analysis on pair of cities that compromise the global net work, we clarify the characteristic of the total structure in global city system.

The construction of this paper is described as follows. The section 2 reviews the basic model to investigate the relation between the production and urban structural change.

The section 3 describes that the basic model could make clear theoretically the structural change of cities after the world economic crisis 2008. The section 4 demonstrates that the some theoretical conjectures proved in the theoretical are verified by using statistical data of the Greater Tokyo Area. The main results are summarized as follows. 1.The demand function for the buildings in the city is supposed to be based on by single peak shape utility functions and have reflected spatial character in quality of building. 2.The structural changes in global cities after the world financial crisis 2008 are analyzed theoretically. When the quality of buildings in the main global cities with advanced financial function is lowered by the critical economic crisis, not only high quality but also low quality buildings indirectly related with the high quality districts are decreased together (Proposition1). In the cities of the manufacture which are affected by the secondary impact of the world economic crises, the low quality buildings to produce industrial products do not only decline by the shrinking world markets but also the high quality offices in CBD deteriorate with a time log (Proposition 2). 3.The theoretical conclusions are demonstrated by statistic analysis regarding the Greater Tokyo Area.

2. A spatial model of urban structure analysis

This paper aims to make clear the market mechanism of urban reconstruction after the world economic crisis 2008 by employing the model analysis presented by Tanaka(1994). To develop theoretical analysis on globalized economies, the section 2 reviews the fundamental characteristics of the model analysis. The qualitative index of urban environment is denoted by i . The demand and supply of urban buildings are arranged by this index i . The buildings are classified by durable goods and lent for offices or residences. The lag exists between the demand and supply. The number of suppliers is denoted by n . It is supposed that agents f ($f=1, \dots, n$) to supply one unit of office or residence with quality i are assumed to obtain one of optimistic and pessimistic profit expectations according to situations. The expected rent revenue functions

$r_f(i;1)$ and $r_f(i;2)$ are supposed to be concave for the type 1 and 2. When

$$\frac{dr_f(i;1)}{di} > \frac{dr_f(i;2)}{di}, f=1, \dots, n, \quad (1)$$

is satisfied for any i , the agent f is defined as optimistic in situation 1. Similarly, the agent f is referred as pessimistic in the situation 2. Although the condition (1) seems too restrictive to be satisfied for any i , (1) implies some expanded explanation for the practical research. It is assumed that each agent f is concerned with only a limited

range around the own optimal quality. Tanaka (1994) supposed that the high and the low qualities of buildings are provided in urban residential and office markets. The cost function to supply one unit of office or residence with quality i is supposed to be written by the increasing function $C(i)$. To state strictly, inequalities $\frac{dC(i)}{di} > 0$,

$\frac{d^2C(i)}{di^2} > 0$ are satisfied. The profit functions $\pi_f(i;1)$ and $\pi_f(i;2)$ are defined by

$$\pi_f(i; j) = r_f(i; j) - C(i), j = 1, 2. \quad (2)$$

And $\pi_f(i; j)$ is supposed to be concave for the situation 1 and 2. When i_1 and i_2 present the optimal qualities with the optimistic and the pessimistic, according to the following reasoning we make certain that the inequality $i_1^f > i_2^f$ holds. i_1^f and i_2^f are defined to satisfy the expression

$$\frac{d\pi_f(i_1^f; 1)}{di} = \frac{d\pi_f(i_2^f; 2)}{di} = 0. \quad (3)$$

Reminding that (1) is rewritten by

$$\frac{dr_f(i_1^f; 1)}{di} - \frac{dC(i_2)}{di} > \frac{d\pi_f(i_2^f; 2)}{di} = 0,$$

and that for i_1 ($i_1^f > i_2^f$)

$$\frac{dr_f(i_1^f; 1)}{di} < \frac{dr_f(i_2^f; 1)}{di} \text{ and } \frac{dC(i_1^f)}{di} > \frac{dC(i_2^f)}{di}$$

hold, the theorem of intermediate value on the above continuous functions certifies to obtain (3).

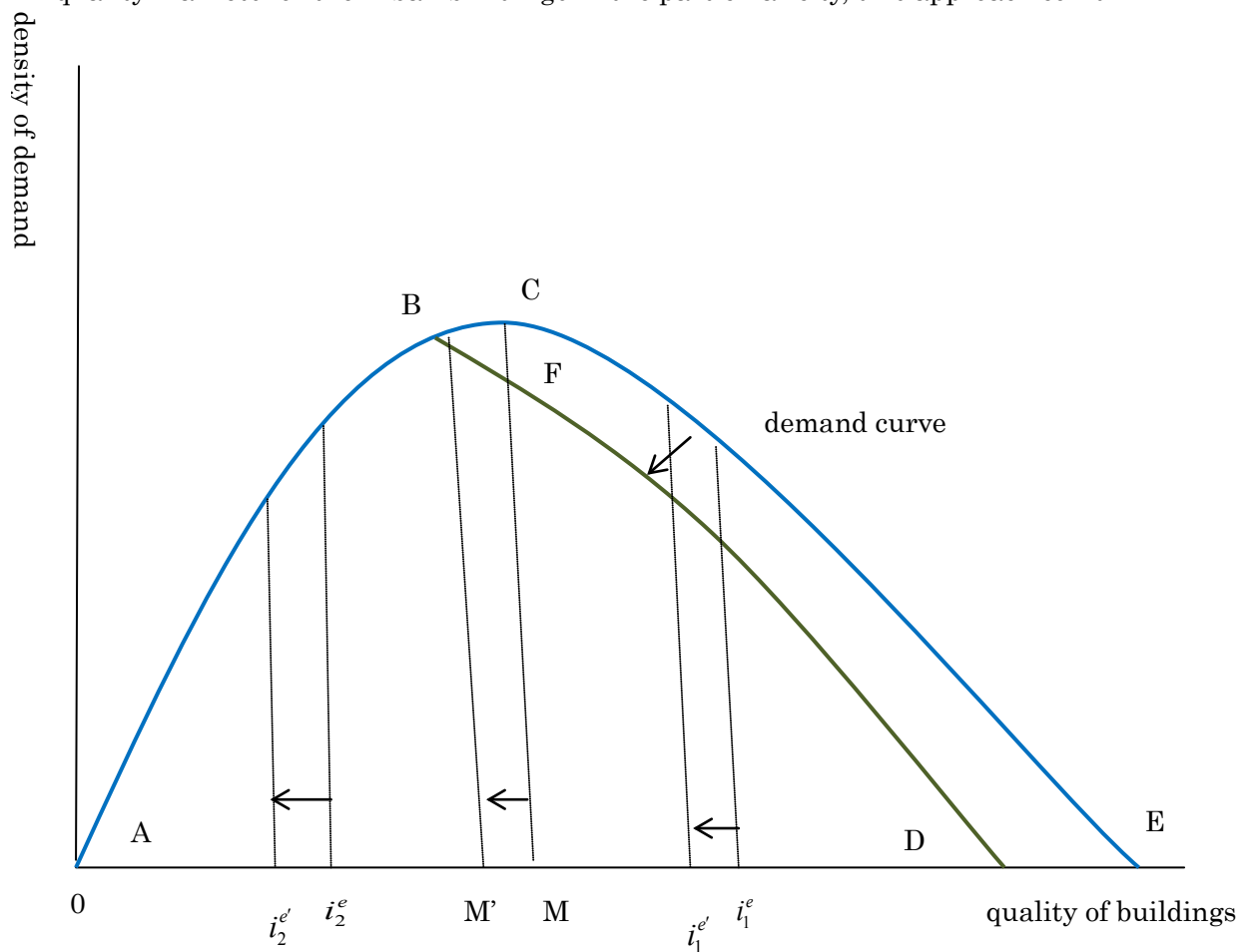
The market equilibrium qualities for high and low one are denoted by i_1^M, i_2^M . It is assumed that the expected profit function of supplier f and the utility or benefit function of purchaser h are symmetric regarding the optimal point i^f or the ideal point i^h . Considering profits or utilities, the supplier f and the purchaser h decide to enter the high or the low quality market which is closer from i^f or i^h ³.

3. International relations between market and urban structure after the global financial crises 2008-09

³ Proposition 2 of Tanaka(1994) explains in detail..

In the beginning of the 2000s the large amount of financial assets flowed into the urban office market in the major advanced countries. Although the enlarged market economies activated urban redevelopment in this period, the evaluated value of urban offices decreased rapidly and many empty offices appeared in global leading financial centers such as Wall Street, New York and City, London after financial crisis 2008. The influence of the financial crisis depressed the world production and rose unemployment by the way of the enlarged global net works. Consequently, the increasing bad debts are targeted as the imperative problems for the whole global community. The rapid spreading waves of global business are expected to fluctuate not only economies but also communities or urban structure fundamentally.

This section presents the theoretical model analysis to make clear the interrelation between economies and urban structures in the globalized network communities. Although Tanaka(1994) develops a general equilibrium analysis on the low and high quality markets for the urban buildings in the particular city, this approach could



Source: Figure 1 of Tanaka(1994)

Figure 1 the urban transformation in the global cities

provides an efficient index to evaluate the inter dependence between the pair objective regions in the global network of cities. In the first step, we focus on the primary change in the leading global cities. The explanation by employing graphs provides an efficient analytical tool to consider the general equilibrium analysis of the urban structural change. Figure 1 depicts the demand functions on the low and the high quality office markets. This figure measures the quality of office along horizontal axis and the density of ideal quality to purchase for along vertical axis.

Although the distribution function is important to estimate the two markets analysis, we suppose that the function is presented approximately by a normal distribution in the theoretical approach. Initially, the demand curve of the office markets is supposed to be expressed by curve ACE. The intermediate point M between the high and the low market equilibrium qualities i_1^e, i_2^e is the border of the two distinct quality office market. Reminding that each market provides the single equilibrium quality of office, the individuals or agents to obtain their ideal or optimal points beyond point M select the high quality i_1^e , and ones to have the ideal or optimal points in the scope under point M decide to demand i_2^e . In the market equilibrium, the amounts of demand and supply for the low and high quality office is depicted by the area ACM and CME. The concave figure ACB is transformed by the growth and the decline of cities. We could utilize this graphical model to analyze the factors to bring about the dynamical changes of the urban structure. Applying the graphical analysis, Tanaka (1994) simulates the interrelation between the two quality markets as follows. The over demand on the high quality building brings about improvement in the both quality markets. The over supply on the high quality building lowers the qualities of both markets. The over demand in low quality market contributes equalization of the both market. The excess supply in the low quality market enlarges the gap between the both markets. The history of urban transformation in the period of the Japanese lost two decades could be explained approximately by the simple theoretical analysis.

However, Tanaka(1994) supposes the integrated or complete urban system initially. The globalization in a couple of decades has developed complicatedly related networks of cities. As a large number of researches of urban economics investigate the efficient function of global urban system, we must reform the simple theoretical model presented by Tanaka (1994) into a global network city model. In this paper, we suppose that the city is a component of global network. The two markets are influenced by the global

network but the equilibrium qualities are decided by the local supply and demand.

The urban transformation affected by the global financial crisis 2008-09 could be explained by the graphical analysis presented above. In the first, Figure 1 shows the effects of the financial crisis in the leading global cities. The great depression in the financial markets swells the debts of financial assets. To depress the bad debts financial industries must recover the profit and shrink the unprofitable sections of the business. The large part of demand of offices and the related residences is lost in the central part of global cities. The decreased demand of offices in the high quality market is expressed by the area CFDE and the excess supply appears. The high quality market aims at the equilibrium and lowers the market quality to increase the demand. The border point M between the low and high markets moves left to M' . A part of the low quality market is transformed into the high quality market and the market quality shifts downward. The tow market equilibrium qualities after the financial crisis are obtained simultaneously at $i_1^{e'}$, $i_2^{e'}$ and the market equilibrium amounts are presented by the

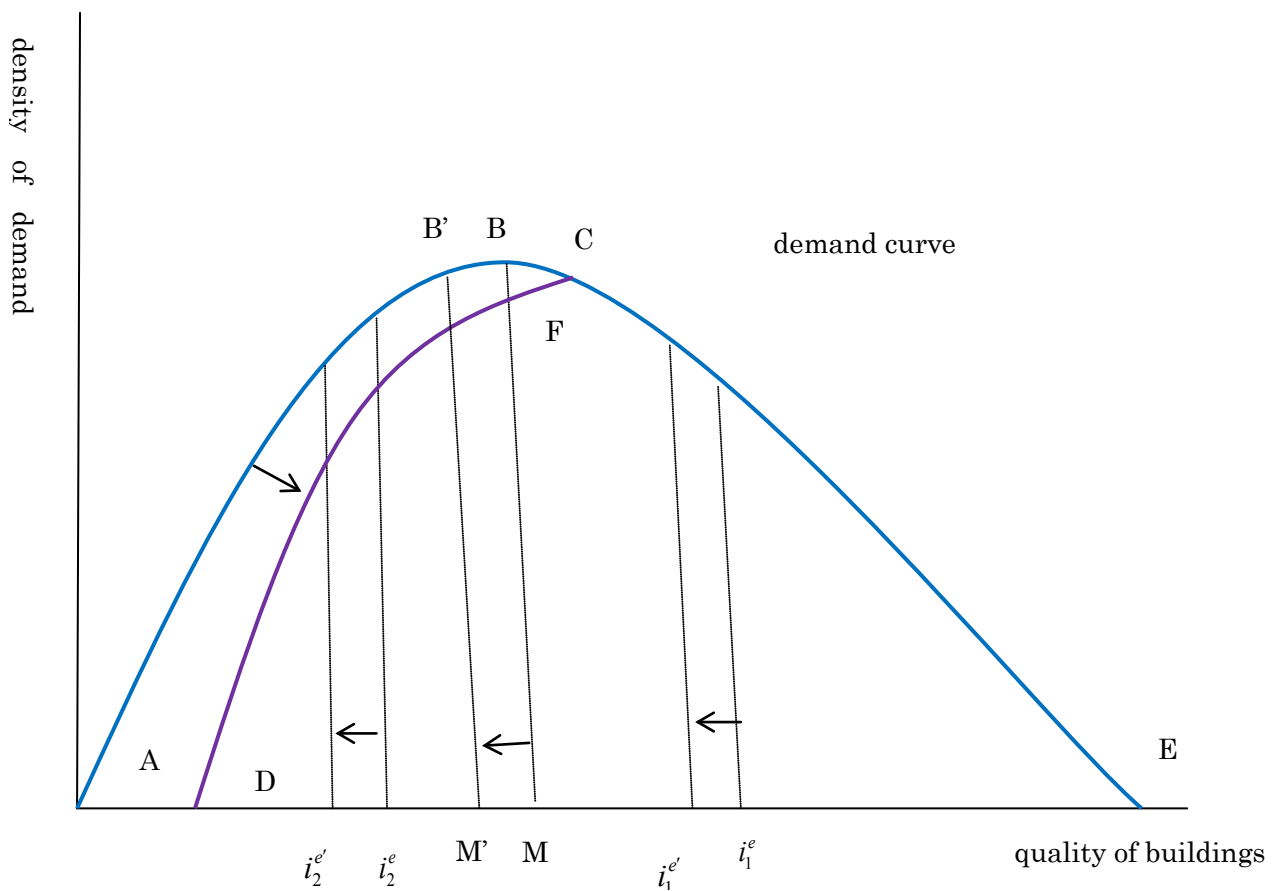


Figure 2 Urban transformation in the secondary cities

area of $B M' D$ and $A M' B$. We state the consequence described above as the proposition 1.

Proposition 1 The excess supply of offices and residences in central business district (CBD) after the financial crisis lowers not only the high quality market but also low quality market in the leading global cities⁴.

The above proposition considers the mechanism that the leading global cities are expected to lower qualities of offices and residences in the both the central and the surrounding districts in the global financial crisis. The restructure of the major cities could not complete within the particular regions. The internationally connected network of cities might transmit the collapse of urban quality in the leading cities to the secondary city in the global city network. The many manufacturing cities or regions have suffered the great depression from the financial crisis. By using Figure 2 we could illustrate the transformation in the city of manufacture. The world financial crisis decreases the demand of exporting products in the city. When the residences and the factories are located in the low quality district of buildings, the slowdown of the products brings about the declining demand and the excess supply in the low quality residence and office market. Figure 2 shows the change of low quality market by the shift in the part of demand curve from ABC into DFC. The decline of demand influences the structure of the city. Although the historical and political instruments affect the reconstruction of the city, the model analysis makes clear some possibilities to be happen. We could investigate a typical change of the secondary cities in the global network. To cancel the excess supply in the low quality market (area BAFC) a part of the supply in the low quality buildings market is tempted to be traded in the high quality buildings market. The market quality i_2^e moves to the new market quality $i_1^{e'}$.

To compensate the shrunk supply for the low market the high quality market should enlarge but medium market quality declines. The border point M between the two markets and the high market quality i_2^e travel leftward M' and $i_1^{e'}$ to seek for new equilibrium. Figure 2 illustrates that a large scale of deterioration in the low quality buildings might depress the function and the attractiveness of the whole city. The reconstruction is composed by the destruction of buildings in low market and the decrease of standard in the high quality buildings. The financial crisis in the global

⁴ Tanaka(1994) describes the analysis more theoretically in Proposition 3 .

cities probably might cause the deterioration of whole buildings quality in the secondary city of global network. We have experienced the great negative impacts on the industries and the livings of many countries all over the world. From the above reasoning we conclude Proposition 2.

Proposition 2 The financial crisis after 2008 has lowered the quality of buildings of the secondary cities in the global network. The depressing force affects only in the part directly influenced by the slowdown of world economic activities but also in the indirectly influenced high quality buildings.

4. Urban Transformations in the Greater Tokyo Area

In this section we demonstrate that the theoretical analysis represented by Figure 1 and 2 is applicable for the positive research on the structural change in the Greater Tokyo Area. The Greater Tokyo Area is composed by many municipalities. The analytical method verified successfully in this paper would be an effective approach to make clear the relation between the two regions on the global network of the cities. To proceed the statistical analyses smoothly we focus on the main regions divided into 6 groups, Saitama Prefecture (40 cities), Chiba Prefecture (36 cities), eastern central district of Tokyo Prefecture (23 cities), western city districts of Tokyo Prefecture (26 cities), Kanagawa Prefecture (19 cities), Yamanashi Prefecture (13 cities)⁵.

This paper examines the theoretical investigation on the relation between the urban structure and the financial crisis 2008-2009. Firstly, we should find out the appropriate index to approximate the quality of the building. We examine the three values in the official statistics for efficient indexes⁶: the average income per taxpayer(2009), the average residential land price per one m^2 (2005), the total floor area per household(2009). The total floor area per household is supposed to present a quality of residence or building. Regretfully, the construction of buildings seems to obtain some lag for the contemporary change in economies and societies and the survey is proceed not in every year but in every 5 years interval. We consider residential land price per one m^2 and income per a tax payer to substitute the total floor area index. Sitama, Chiba, Western district of Tokyo share the suburbs of the eastern central district of Tokyo and appear the significant correlation coefficient relation among the three values.

⁵ A official classification includes Ibaraki, Tochigi, Gunma Prefectures in this metropolitan area, but we select regions to investigate the dynamical relation between many integrated cities. Figure 6 presents the regional map for this research.

⁶ The data sources are obtained in the surveys of Ministry of land, infrastructure, transport and tourism, and Ministry of internal affairs and communications.

Considering that advantageous locations are likely to connect with the better

Table 1 Correlation coefficients with total floor area per a household			
prefecture and district	residential land price per one m ²	income per a tax payer	significant test
Chiba	-0.8396	-0.7217	1% yes
Sitama	-0.9305	-0.7540	1% yes
Central Tokyo	0.0786	0.2028	no
Western Tokyo	-0.7618	-0.5534	1% yes
Kanagawa	-0.4043	0.0796	no
Yamanashi	-0.5206	-0.5044	no

Source: city data pack 2010, Toyo Keizai Simpousha

opportunities of profitable businesses and jobs, the residents would seek to locate in nearer or easier region in access to the central district of eastern Tokyo. They confront with the a severe competition to get own residence. Consequently, the following situations tend to appear in the advantageous location. The total floor area becomes small and the price of residence increases but they could yield high incomes. Because Yokohama city located in Kanagawa is too large to compare with other cities of Kanagawa prefecture, for the statistical approach. Yokohama should be divided into some small units appropriately. Yamanashi is more independent of the eastern central district of Tokyo than the other 5 districts and shows limited network functions with these districts.

The correlation coefficients indicated in Table 1 show how the 6 districts constitute a

Table 2 Averages in the 3 indexes			
prefecture and district	total floor area per a household	residential land price per m ²	income per tax payer
	2005	July 1,2009	July,2009
	m ²	million yen	ten thoutand yen
Chiba	96.9	700.3	333.6
Sitama	86.0	1229.4	339.2
Central Tokyo	61.2	6039.4	488.0
Western Tokyo	70.0	2208.4	383.1
Kanagawa	82.2	1596.3	369.3
Yamanashi	111.2	368.8	297.2

Source: city data pack 2010, Toyo Keizai Simpousha

compound of cities. Table 2 represents the averages of the three indexes and illustrates

the total figure of the Greater Tokyo Area. Table 2 makes clear that the eastern central district of Tokyo is the core of the compound cities and locates in the most efficiently utilized area of buildings.

Figure 3–5 illustrate clearly the spatial features in the Greater Tokyo Area. The figure 3 shows the single valley shape of the total floor area per a household for the 6 districts. It implies the high profitability in the eastern central district of Tokyo as follows. The more profitable the district is expected to be, the more costs with the agents spend to occupy a large space. The figure 4 and the figure 5 express the single peaked curves at the eastern central district of Tokyo for the residential land price per m^2 and the income per tax payer. The eastern central district of Tokyo is highest in income of tax payers and residential price. Although the quality of the buildings depends on many factors, the residences that are higher price and purchased by individuals of higher income are supposed to be equipped with a certain quality assurance. This paper

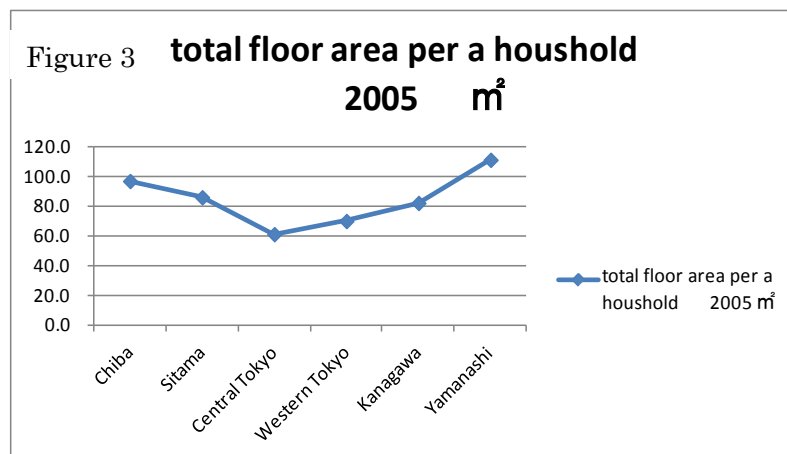
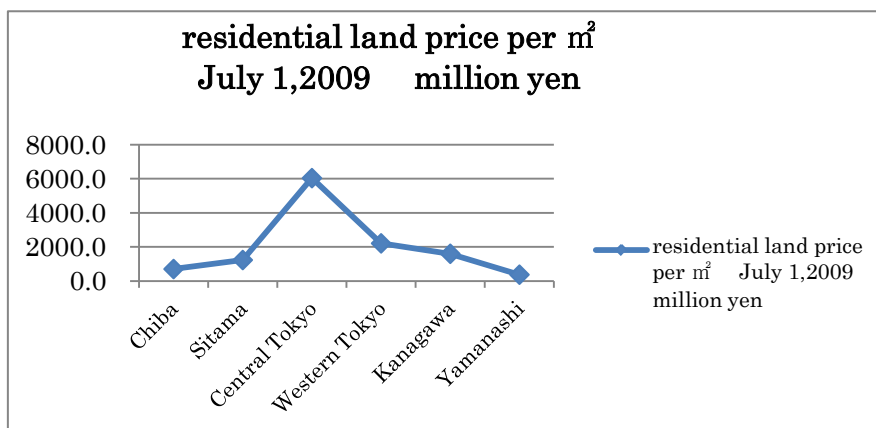
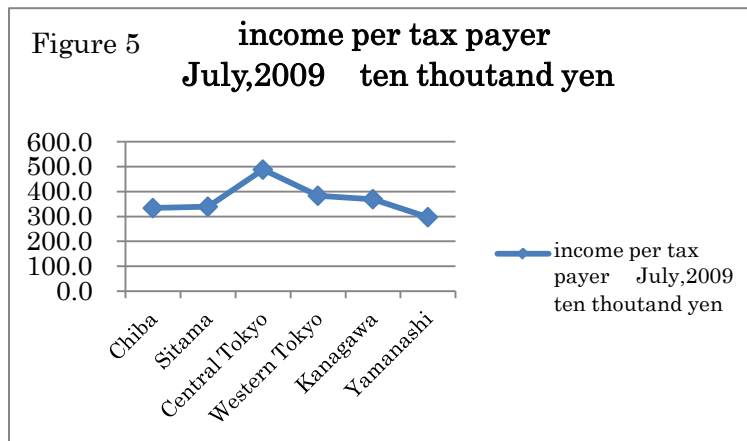


Figure 4





focuses on the two indexes are evaluated significantly by residential markets in quality of buildings. Consequently, the first and the second order of the districts are the east central and the west districts of Tokyo. It is assumed in the following positive investigation that the high and the low quality building markets are approximated by the markets in the east central and the west districts of Tokyo. By replacing the 3 indexes of the eastern central and eastern districts of Tokyo into the high quality and the low of buildings in Figure 1 and 2, the theoretical theorems of Proposition 1 and 2 are demonstrated positively.

Table 3 and 4 correspond to the illustrations by each Figure 1 and 2. Because the rate of change in total floor area could not cover the urban structural change after global financial crisis 2008, the rate of changes in residential land price and in income per a tax payer should be the appropriate indexes for the quality of buildings. It is certain clearly that the averages of two indexes decrease together in the both tables. We could conclude that Proposition 1 and 2 are proved in the empirical investigation on the Greater Tokyo Area. Reminding that rate of change in income per a tax payer is greater than the rate of changes in residential land price in the averages and that two indexes show significant correlations⁷, we consider the theoretical results in some detail by observing rate of change in income per a tax payer. According to values in 2010 Table 5 classifies 6 cities that income per a tax payer is over 5 million yen and other 17 cities that the income is less than 5 million yen.

⁷ The correlation coefficients between the two indexes are 0.95 in the eastern central district of Tokyo and 0.87 for the western district of Tokyo.

Table3 rates of change in the 3 indexes (eastern central district of Tokyo)			
city	rate of change in total floor area per a houshold	rate of change in residential land price per m ²	rate of change in income per a tax payer
term(years)	(2008-2005) /2008	(2011-2009))/2011	(2010-2009))/2010
Chiyoda	-6.4%	-7.3%	-4.6%
Chuo	-0.7%	8.1%	-12.7%
Minato	-10.3%	-8.0%	-13.0%
Shinjuku	-4.8%	-5.4%	-8.6%
Bunkyo	3.0%	-7.8%	-8.9%
Taito	3.8%	-8.4%	-4.9%
Sumida	7.2%	-5.7%	-3.7%
Koto	1.1%	-4.1%	-3.0%
Sinagawa	-3.6%	-5.2%	-5.6%
Meguro	-2.0%	-2.3%	-6.8%
Ota	1.4%	-4.7%	-6.7%
Setagaya	-10.0%	-3.9%	-6.4%
Shibuya	-1.5%	-4.8%	-13.4%
Nakano	-0.2%	-5.6%	-4.4%
Suginami	-0.2%	-2.5%	-4.5%
Toshima	-6.9%	-4.9%	-4.5%
Kita	4.5%	-3.1%	-3.9%
Arakawa	2.8%	8.4%	-3.1%
Itabashi	-5.2%	-4.7%	-4.1%
Merima	-0.7%	-3.1%	-4.7%
Adachi	0.3%	-5.7%	-3.8%
Katsushika	5.7%	-2.5%	-4.3%
Edogawa	1.7%	-4.9%	-4.4%
Average	-0.8%	-4.3%	-6.8%

Table4 rates of change in the 3 indexes (western district of Tokyo)			
city	rate of change in total floor area per a houshold	rate of change in residential land price per m ²	rate of change in income per a tax payer
term(years)	(2008-2005) /2008	(2011-2009))/2011	(2010-2009))/2010
Hachioji	1.6%	-5.6%	-5.0%
Tachikawa	0.3%	-6.4%	-5.1%
Musashino	2.6%	-3.2%	-6.0%
Mitaka	-5.0%	-3.4%	-5.3%
Ome	4.1%	-7.9%	-6.3%
Fuchu	1.6%	-3.5%	-4.4%
Akishima	0.7%	-4.7%	-6.0%
Choufu	-1.5%	-4.4%	-5.2%
Machida	1.6%	-3.5%	-5.9%
Koganei	-3.9%	-4.0%	-4.0%
Kodaira	2.3%	-6.3%	-5.3%
Hino	4.1%	-6.1%	-4.8%
Higashi Murayama	2.2%	-5.3%	-4.8%
Kokubunji	-0.8%	-4.4%	-6.2%
Kunitachi	0.5%	-3.9%	-3.4%
Fussa	6.4%	-7.5%	-5.7%
Komae	1.2%	-2.4%	-5.9%
Higashi Yamato	2.7%	-5.8%	-4.3%
Kiyose	-1.5%	-4.2%	-1.6%
Higashi Kurume	0.8%	-3.9%	-4.4%
Musashi Murayama	-8.4%	-6.1%	-5.6%
Tama	0.6%	-4.2%	-5.0%
Inagi	-0.6%	-1.5%	-5.6%
Hamura	2.1%	-6.8%	-7.2%
Akiruno	2.6%	-8.9%	-5.8%
Nishi Tokyo	0.0%	-5.1%	-3.2%
Average	0.7%	-4.6%	-5.1%

Source: city data pack 2010, Toyo Keizai Simpousha

It is assumed that the upper 6 cities form the market of the high quality buildings and the other 17 cities compose the low quality building market. The greater decline rate of average 9.9% in the high quality buildings market initiates a derivative slowdown of demand (4.7% rate of decrease)in the low quality buildings market. The statistical reasoning could support the theoretical

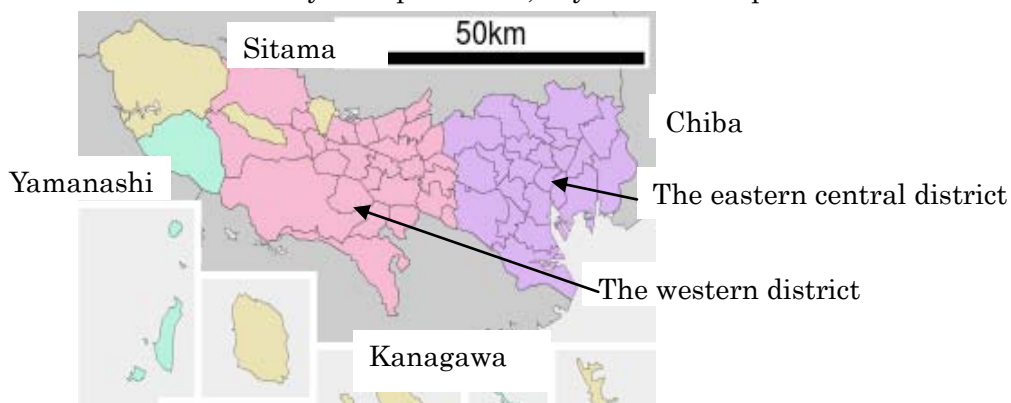
result in Proposition 1 consistently. Table 6 demonstrates the argument in proposition 2. The two groups of income per a tax payer may not show significant differences. And the average is near to the low income group in Table 5. The overwhelming influence of the eastern central district of Tokyo depresses the quality of buildings of the western district of Tokyo comprehensively.

Table 5 the low and high quality markets in the eastern central district of Tokyo				
city	income per a tax payer	income per a tax payer	rate of change in income per a tax payer	the two group averages
term(years)	million yen July,2009	million yen July,2010	(2010-2009)/2010	
Minato	1065.9	943.5	-13.0%	-9.9%
Chiyoda	807.0	771.3	-4.6%	
Shibuya	730.9	644.3	-13.4%	
Chuo	610.0	541.3	-12.7%	
Bunkyo	583.2	535.3	-8.9%	
Meguro	558.0	522.6	-6.8%	
Setagaya	528.7	497.1	-6.4%	-4.7%
Shinjuku	508.7	468.3	-8.6%	
Suginami	455.1	435.4	-4.5%	
Sinagawa	442.7	419.2	-5.6%	
Ota	421.8	395.4	-6.7%	
Toshima	420.5	402.4	-4.5%	
Merima	414.9	396.2	-4.7%	
Nakano	402.4	385.4	-4.4%	
Taito	400.7	381.9	-4.9%	
Koto	397.4	386	-3.0%	
Itabashi	364.6	350.1	-4.1%	
Edogawa	361.9	346.8	-4.4%	
Sumida	360.8	347.9	-3.7%	
Kita	356.3	342.9	-3.9%	
Arakawa	352.5	342	-3.1%	
Katsushika	344.6	330.3	-4.3%	
Adachi	335.8	323.5	-3.8%	

Source: city data pack 2010, Toyo Keizai Simpousha

Table6 the low and heigh markets in the western district of Tokyo			
city	income per a tax payer	rate of change in income per a tax payer	the two group averages
term(years)	million yen July,2010	(2010-2009) / 2010	
Musashino	469.6	-6.0%	-5.0%
Kunitachi	429.1	-3.4%	
Koganei	410.4	-4.0%	
Mitaka	409.4	-5.3%	
Kokubunji	408.1	-6.2%	
Choufu	391.4	-5.2%	
Inagi	381.6	-5.6%	
Machida	380.5	-5.9%	
Nishi Tokyo	375.5	-3.2%	
Fuchu	374.4	-4.4%	
Kodaira	372.9	-5.3%	
Komae	367.4	-5.9%	
Tama	365.1	-5.0%	
Hino	359.2	-4.8%	-5.1%
Hachioji	350.6	-5.0%	
Tachikawa	349.6	-5.1%	
Higashi Kurume	349	-4.4%	
Higashi Murayama	344.4	-4.8%	
Kiyose	341.9	-1.6%	
Higashi Yamato	339.4	-4.3%	
Akishima	327.7	-6.0%	
Hamura	325.9	-7.2%	
Akiruno	318.3	-5.8%	
Ome	317.7	-6.3%	
Fussa	313.8	-5.7%	
Musashi Murayama	308	-5.6%	

Source: city data pack 2010, Toyo Keizai Simpousha



Source: <https://ja.wikipedia.org/wiki/%E6%9D%B1%E4%BA%AC%E9%83%BD>

Figure 6 Greater Tokyo Area and two districts of Tokyo Prefecture

5. Concluding Remarks

Tanaka (1994) developed a theoretical model to analyze the Japanese urban transformation in the 1990s after the bubble economies. This approach is classified as the spatial theory of general equilibrium analysis on the urban structural change. In this model, assuming that influences from outside the region are given, we could consider the inner regional reconstruction. For the couple of decades from the 1980s the economic activities had enlarged all over the world rapidly. Sustainability became to be recognized as the urgent problem to be solved cooperatively in the world. The sustainability might not only mean global environmental problems but also the reconstruction of the social systems. The enlargement of global economies does not only increase interregional movements of the goods, services and information but also transform urban structures more sensitive to external changes. The spatial theoretical model should improve the effectiveness in the context of inter urban analysis.

This paper demonstrates that this theoretical analysis to investigate the inner urban transformation is effective also on the inter urban transformation to the both theoretical and positive researches. This paper constructs the propositions to explain the urban transformation in the Greater Tokyo Area after the global financial crisis 2008-2009. The propositions state that the decline in the central business district deteriorates the buildings in the cities connected with urban network and that the slump of demand in the manufacture segment derived from the global financial crisis decreases the qualities of buildings in not only the own segment but also the local core district.

The statistical analysis on the 6 groups of cities in the Greater Tokyo Area confirms the theoretical propositions in this paper. The theoretical approach could research the various possibilities and the effective policies for each case. The statistical analysis offers the evidence and improves the accuracy in theoretical reasoning and the efficient policies. This theoretical model analysis is applicable for the connected urban transformations in the global societies. The spatial theory of general equilibrium could make clear the efficient urban transformation for each city and might contribute sustainability of global communities by developing many positive researches.

References

Alderson, A.S. and J. Beckfield (2007), "Globalization and The World City System: Preliminary Results from a Longitudinal Data Set," Taylor, P.J., B. Deudder, P. Saey and F. Witlox (eds) (2007), *Cities in Globalization*, New York, Routledge pp.21-36.

- Capello,R. and T.P.Dentinho (2012), *Network, Space and Competiveness: Evolving Challenges for Sustainable Growth*, Cheltenham,Edward Elgar Publishing.
- Downs,A.(1972), *An Economic Theory of Democracy*, New York,Harper and Row.
- Hotelling,H.(1929), "Stability in Competition," *Economic Journal*, 39, pp.41-57.
- Friedmann,J.(1986), "The World City Hypothesis," *Development and Change* 17(1) pp. 69-83.
- Kennedy,C.(2011),*The Evolution of Great World Cites: Urban Wealth and Economic Growth, Guestioning Cities Series*, Toronto, Buffalo and London, University of Toronto Press.
- Komninos,N.(2008), *Intelligent Cities and Globalisation of Innovation Networks*, Routledge ,London and New York.
- Korff,R.,(1987), "The World City Hypothesis: A Critique," *Development and Change*, 18(3) pp.483-493.
- Tallon,A.(2013), *Urban Regeneration in the UK*, Second Edition, London, Routledge.
- Taylor,P.J.(2001), "Specification of The World City Network," *Geographical Analysis* 33(2), pp.181-194.
- Taylor,P.J, Derudder,B., Saey,P. and Witlox,F.(2007), *Cities in Globalization: Practices, Policies and Theories*, London and New York, Routledge.,
- Short,J.R.(2004),*Global Metropolitan: Globalizing Cities in a Capitalist World*, London and New York, Routledge,.
- Tanaka,H.(1994), "Quality of Buildings and Redevelopment in Cities," *The Institute of Economic Research Chuo University, Research Paper*, No.3 pp.1-18.
- Tanaka,H.(2009),The Sustainable Framework of Climate Change and Financial Crisis 2008-09,pp.1-8. *The Institute of Economic Research Discussion Paper Series of Chuo University*, No.134,2009 ; On line paper of The London Accord, http://www.london-accord.co.uk/index.php?option=com_content&view=article&id=173&Itemid=133
- Tanaka,H.(2011), "Sustainability and Net work Effects in Global Cities," *Long Finance and London Accord Web Papers*, pp.1-24.
<http://www.longfinance.net/programmes/london-accord/396-report-template.html>
- Tanaka,H.(2013), "A Theoretical Model Analysis of Urban Structures after Global Crisis 2008," *Chuo Daigaku Keizaigaku Kenkyukai*, pp.285-303 (written in Japanese).