

Urban Reform and Shrinking City Hypotheses on the Global City Tokyo

Hiroshige TANAKA

Professor of Economic Faculty in Chuo University, 742-1 Higashinakano Hachioji city
Tokyo 192-0393, Japan.

Chiharu TANAKA¹

Manager, Mitsubishi UFJ Kokusai Asset Management Co., Ltd., 1-12-1 Yurakucho,
Chiyodaku, Tokyo 100-0006, Japan.

Abstract

The relative advantage among industries has changed remarkably and is expected to bring the alternatives of progressive and declining urban structural change. The emerging industries to utilize ICT, AI, IoT, financial and green technologies foster the social innovation connected with reforming the urban structure. The hypotheses of the shrinking city forecast that the decline of main industries has brought the various urban problems including problems of employment and infrastructure. But the stringent budget restriction makes limit the region on the social and market system that the government propels the replacement of industries and urban infrastructures. By developing the two markets model of urban structural changes based on Tanaka (1994) and (2013), we make clear theoretically and empirically that the social innovation could bring spreading effects within the limited area of the region, and that the social and economic network structure prevents the entire region from corrupting. The results of this model analysis are investigated by moves of the municipal average income per taxpayer of the Tokyo Area in the period of 2011 to 2014 experimentally.

Key words: a new type of industrial revolution, shrinking city, social innovation, the connectivity of the Tokyo Area, urban infrastructures.

1. Introduction

The policies to liberalize economies in the 1990s have accelerated enlargement of the

¹ C. Tanaka owes the task of statistical analysis and project evaluation of urban reforms in section 4 and 5. H. Tanaka is responsible for model analysis of the entire paper.

global market. In the following 2000s the innovations in financial, intelligent and communication industries could improve the network structure of the global economic and social systems. The market economies supported by the evolution in the network systems ensure the efficient supply system in the global structural changes. The hypotheses of shrinking cities obtain common background in the global perspective as follows. The production sites could be located swiftly all over the world. The enlarged supply systems are sensitive for the proper needs on the various regions and might decline the prices of products². The development of innovative markets needs the new types of public goods and requires fundamental reforms of social structure. The lowering prices in the markets bring about structural changes in the demands of the goods and service, and make great impacts on the soft and hard infrastructures in the communities locally and globally.

The revenue of the government does not tend to increase in contrast with enlarging global market. The fierce competition among the global economies induces multinational corporations to lower the tax burdens. The weight of the governmental contribution on the funds of urban infrastructures should decline. To complete regional structural changes the related public goods should be provided with the public private cooperation. The effective reforms in hard and soft infrastructures could not only lead activation but also prevent unbalanced development from spreading in the whole urban region. The reforms imply the improvement of the public service system as well as fostering innovations in the industries. The replacement of industries in the large scale requires the reconstruction of effective public and private cooperation. Actually, many global cities have been experiencing the adapting attempts on the reform of urban structures. Since the decline of the main regional industry implies simply lowering activities of the regional economy, the shrinking city problems seek to attain sustainable region and to replace the declining industries by promising ones³. The sustainable region linked with replacement of main industries appears to confront with many complicated conditions to be achieved at the same time⁴. Not narrative but analytical information on the social innovation is necessary for the efficient urban reconstruction.

It is proposed in this paper that a theoretical model approach makes clear the overview regarding problems of shrinking cities. In particular, we introduce hypothetical

² Leigh,N.,G.and E.J.Blakely (2013) argue the urban issues caused by the rapid structural change of cities.

³ Richardson, H. and C. Woon Nam(2014) survey the issues of the shrinking cities extensively.

⁴ Tallon,A. (2013) describes the regeneration of urban structure..

propositions to reform urban infrastructures by the experimental analysis on the Tokyo Area. And we demonstrate that the social innovation caused by the replacement of industries could trigger the regional improvement in the central district and that the initial impact should spread steadily in the entire networking Tokyo Area.

Tanaka (1994) argues that the spatial location decision model funded by Hotelling (1929) is reformed to investigate some urban issues dynamically. By employing this urban model Tanaka (2013) investigates the impact on the Tokyo Area in the global financial crisis 2008-2009⁵. This research makes clear that the damages of main industries decline society and economy greatly in the central business district and that the influence of the impact spreads to lower the performance in all over the networking regions. The investigation by the urban model analysis is convinced to be effective method on the change of urban structures. On the other hand of sharp drop of financial industries a series of new technologies such as IT, AI, IoT and renewable energy are beginning to change the view of business fields and social life styles. The innovation of the industries is expected to induce various negative and positive urban issues. Some regions could benefit synergy effects with the social innovation but other regions without efficient urban reform projects to be connective with the innovation should suffer the problems of depressed regions.

To achieve sustainable development of the region we should obtain an entire view of the urban structure by using the model analysis. Main results of this analysis are to provide the theoretical frame work that the recent industrial revolution reforms the urban area. And the theoretical investigations on the structural change are demonstrate by the empirical research on the Tokyo Area in the period of 2011-2014. The theoretical considerations make clear that the hypothesis of shrinking cities turns out the improving regional reform or the decline of regional economies and communities. The results of the empirical research are stated in the 4 propositions. In particular, we describe the benefits of the new industrial revolution only in the Central Tokyo and the other regions suffers negative impacts of shrinking cities but the damage are relatively week and cover the Tokyo Area evenly. That is, within the Central Tokyo prefecture spreading effects of the social innovation is effective positively. As the objective region enlarges, the spreading effects turn into negative. Decline of the economic activity in the Tokyo Area is limited by the supports of the regional network.

The organization of this paper is stated as follows. The section 2 presents a brief information on the Tokyo Area to be read precisely. The section 3 constructs two types of

⁵The first version of this paper contains the misprints of monetary terms Table 2, 5,6. We are ready to revise the errors.

model analysis to explain the issues of the shrinking city. The model could distinguish the connective condition that the both markets enhance in the same direction from the unconnected condition that the two markets move in reverse. In the section 4 the structural change of the Tokyo Area in the period from 2011 to 2014 are analyzed by average income per taxpayer in 121 municipalities. We describe 4 propositions to be investigated. The social innovation at the central core district in the Eastern Tokyo Prefecture. The spreading effects are confirmed to appear in the relatively narrow region such as the Eastern Tokyo Prefecture. Various urban reform projects follow the regional uplift caused by the social innovation with the private and public corporation. But the network structure is supposed to save the entire the Tokyo Area from the great collapse.

2. Structural Framework of the Tokyo Area

The recent researches by the author focus on the network structure of the Tokyo Area. Tanaka (2013) demonstrates that the damages of the global financial crises 2008-09 concentrated more serious on the central district of the area than on the secondary districts. Based on the questioner survey on the municipality, Tanaka (2014) exhibits positively that the Tokyo Area is equipped with the competitive and cooperative regional network. Although the first view of this approach was regional deterioration caused by the global financial crisis, this paper aims at making clear how initial shocks on the urban reform spread to perform social innovations in the regions.



Source: gif-japaneseclass.jp

Figure 1 Map of Tokyo Area in Japan

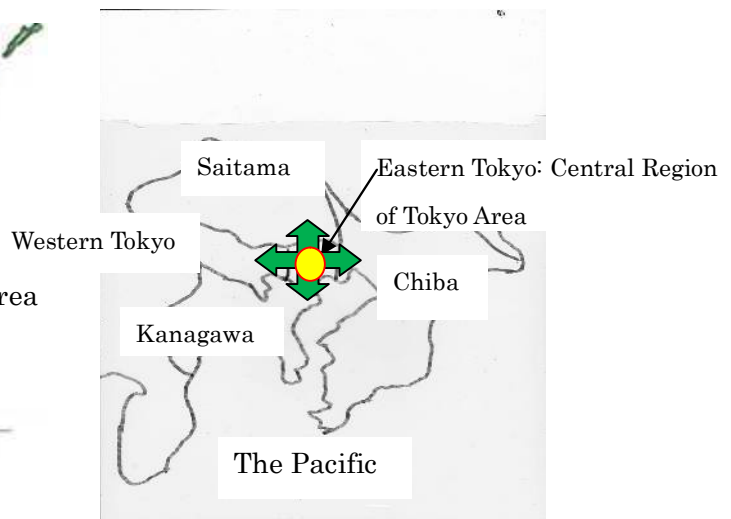


Figure 2 Enlarged map of Tokyo Area

It seems appropriate for many overseas readers to be introduced some basic information for understanding following discussions. The Tokyo Area is located in the east coast of the Japanese islands and shown in the map of Figure 1. The Tokyo Area is composed by Tokyo, Kanagawa, Chiba and Saitama prefectures. This paper divides the Tokyo Prefecture into the western and the eastern regions for comparative analysis with the previous researches such as Tanaka (2013) and (2014). The eastern part of Tokyo prefecture is characterized as the central business district of the Tokyo Area and named as the Central Tokyo in the following chapters. Table 1 shows populations of the top 6 prefectures in 42 Japanese prefectures. Although many prefectures have suffered the pressure of decreasing population, this table exhibits that all prefectures of the Tokyo Area are advantageous and increase population. Since the increment of population might reflect the vitality of the region, the Tokyo Area is expected to be a prominent and leading region to improve economic and social systems of Japan. The Tokyo Area is a global city and a center of global network in the global economies. This paper discusses the problems of shrinking city in the global city⁶ and argues how social innovation and network of region turns the problems to be progressive.

The diversity of the Tokyo Area makes possible to create an appropriate way out from serious urban problems. In the network structure of the Tokyo Area the main arterial roads and rail ways are formed by the set of radiations from the Central Tokyo. Some beltways are constructed to compensate the main arterials and strengthen the network structure. The concentrating system in the Tokyo Area is analyzed by the four directions; Central Tokyo and Western Tokyo, Central Tokyo and Chiba, Central Tokyo and Kanagawa, and Central Tokyo and Saitama.

Table1 The top 6 Prefectures

Ranking	Prefetures	population by national census 2010	The latest survey population	growth rate	date of the survey
1	Tokyo	13,159,388	13,512,186	2.68	Feb 1,2016
2	Kanagawa	9,048,331	9,127,389	0.87	Feb 1,2016
3	Osaka	8,865,245	8,837,032	-0.32	Feb 1,2016
4	Aichi	7,410,719	7,491,045	1.08	Feb 1,2016
5	Saitama	7,194,556	7,264,976	0.98	Feb 1,2016
6	Chiba	6,216,289	6,225,396	0.15	Feb 1,2016

Source : Wikipedia; Summarv of Population on Japanese Prefectures

<https://ja.wikipedia.org/wiki/%E9%83%BD%E9%81%93%E5%BA%9C%E7%9C%8C%E3%81%AE%E4%BA%BA%E5%8F%A3%E4%B8%80%E8%A6%A7> (2016.4.12)

⁶ Friedmann (1986),(2002) and Kennedy (2011) argue the prospects of the world city or the global city.

3. The theoretical foundation of urban model

Tanaka (1994) initiates a general equilibrium model analysis on the urban structural change. Tanaka (2013) provides analytical investigation on the Tokyo Area by this mathematical model in the period of the global financial crisis 2008-2009. This theoretical approach should be confirmed by another experimental research on the shrinking city. It is supposed that the Tokyo Area is facing with the shrinking cities problems in the 2010s. The shrinking city issues are expressed by the replacement on main industries and social innovation in the urban region. This model analysis makes clear the structural change by the social innovation in the Tokyo Area.

This paper employs a graphical approach for urban issues regarding shrinking economies and social innovations. We start the investigation by making a brief review of the spatial model analysis. Buildings in the urban space could be distinguished by an integrated index of quality to satisfy social needs. The market of residence is supposed to provide the low and the high quality buildings. The competitive analysis of the spatial theory by Hotelling (1929) is applied on the urban transformation.

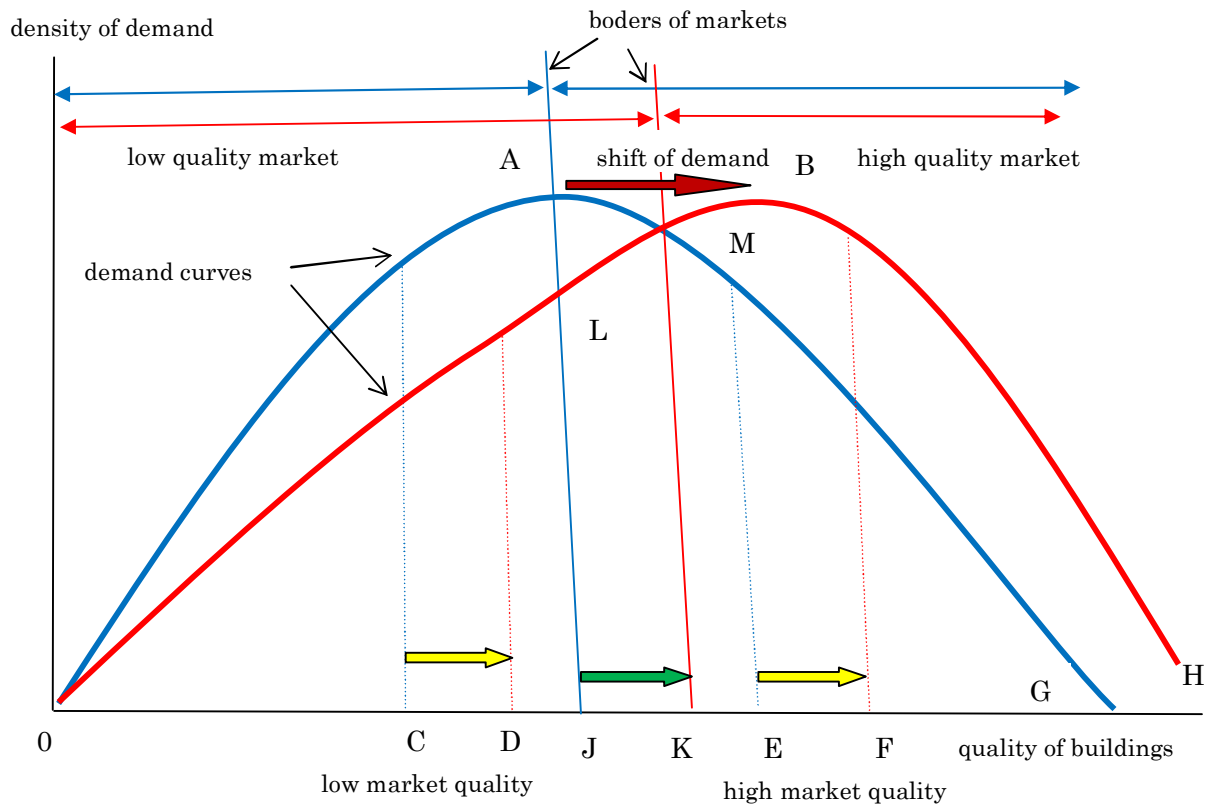
It is assumed that each user of the building obtains the most preferable or the own ideal quality of the building and chooses more preferable one. In this graphical analysis urban residents are supposed to distribute spatially according to ideal qualities. Their preferences are determined by the distance from the own ideal quality. The utility of building is decreasing with the distance from the ideal quality. The residents select the building with the quality to be the least distance from the own ideal point. They have alternatives to choose between the high and the low qualities of buildings. On the other hand the supply of building is expressed with a lag of production for the construction period. When an alteration of main industries in the region shifts the demand curve of residences, the changing demand and inflexible supply bring about the gap between demand and supply temporally. Since the quality is expected to reflect the rent of the building, the change of market quality could transfer demands and supplies of the markets. The imbalance of the supply and the demand revises the expected rent for residences and moves the supply of residences to correspond with the gap between the demand and the supply. To simplify the explanation, the supplies of the markets are assumed to be induced by the trading index of qualities. In the markets of buildings the qualities are endogenous variables to equilibrate supplies and demands in the two quality markets. The both markets reach the two equilibriums at the same time by adjusting the markets.

Probably this model analysis could clue many kinds of urban issues. In this paper, we consider mainly social influences caused by revolutionary replacement of industries. In

the first, we suppose that the decline of traditional manufacture and the development of intelligent industries occur independently in the same region. In figure 4 the alteration of industries shifts the demand function of residence from curve OAG to curve OBH . Before the shift, the market equilibrium qualities are indicated by C and E . Since the utility function is decreasing by the distance from the ideal point, individuals whose ideal points locate the left side of the middle point J between C and E gain greater utility at the lower quality market than at the high market. By the similar reasoning individuals with the right ideal points from J prefer the high quality market building to the low one. The border J of the two markets keeps CJ and JE in the same distance.

Firstly, the innovation in the high quality market requires the reform of social infrastructure by investing large amount of public and private funds. Consequently, the high quality market could upraise market quality from E to F by reducing the scale of the high market. The border point of the two markets move from J rightward to K . Secondly, since the movement of the high market quality transfers the part of the previous high quality market into the low quality market, to satisfy the newly coming residents with relatively higher social needs the enlarging low quality market shifts the market quality from C rightward to D . The enhancement of market quality is assumed to increase market supply. In this case, the excess demand at the previous market quality C takes the equilibrium point C rightward to D . In the low market the reduced area OAL is cancelled out by the enlarged area $LJKM$. In the high market the lost area $AJKM$ is smaller than the developed area $GMBH$. This graph implies that shrinking manufacture region depicted by the area $OAML$ should be replaced by the developed area $GMBH$ to sustain urban life and business. The reform of the region needs an appropriate provision of public goods for both low and high quality markets to improve quality of residences. That is, to prevent the shrinking manufacture industries from deteriorating regional environments, the innovations in social and industrial structures should perform effectively. A large trend of innovation such as IT, AI, renewable energy, financial technology should require the structure change by the development in the high quality market and replacing investment in the low quality market.

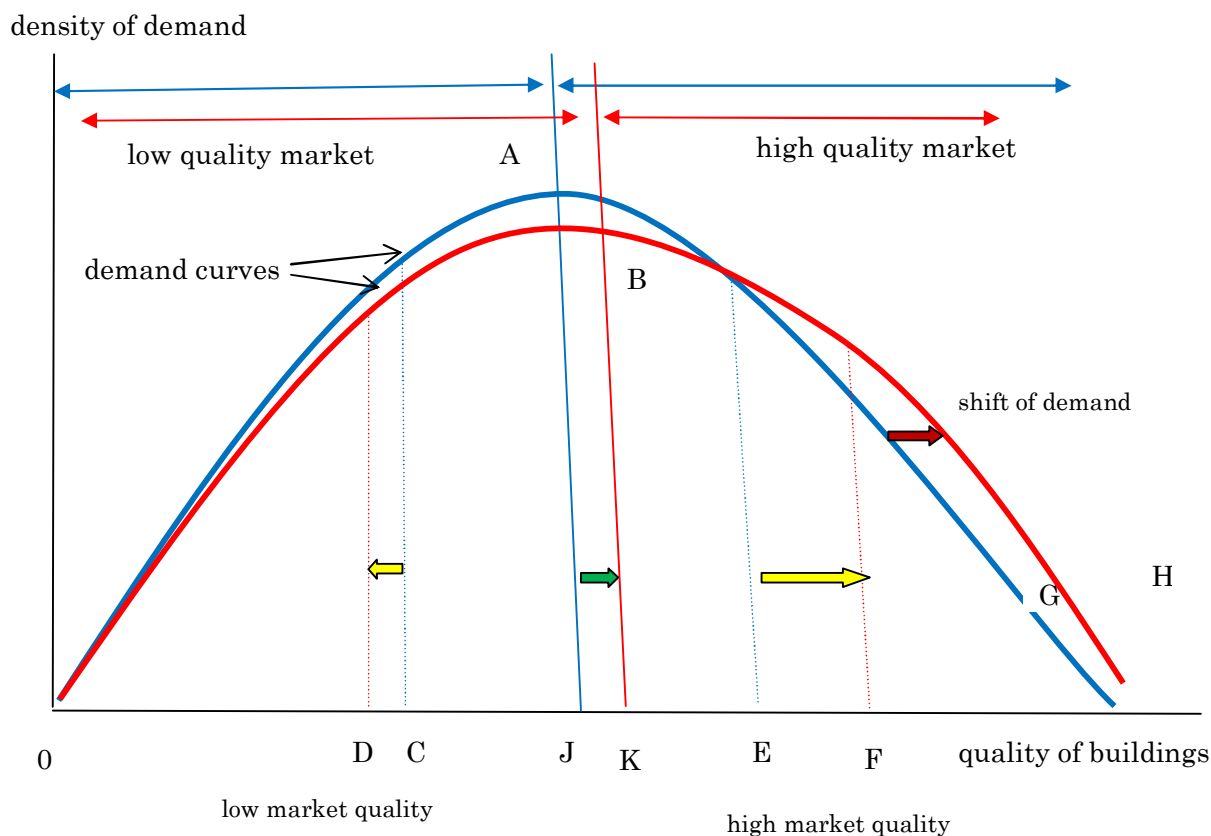
Figure 4 presents an optimistic view of the shrinking cities. In this situation, the business or private sector tends to improve reforms in urban region and the reconstruction projects by the public sector have advanced with the active support of the private sector. Figure 5 illustrates that the development in the high quality district is too weak to cancel the negative impacts of the urban issues occurred in the low quality market. Even if the revolution in the high technology such as financial and artificial technologies improves steadily, the low quality residences remain to deteriorate



Source: produced by Hiroshige Tanaka

Figure 4 Connected urban reform in the two quality

and come to cause social problems such as enlarging disparity. Figure 5 shears similar graphical expressions with Figure 4. Development of industries with high technology upraises the market quality by the length EF in high quality buildings. When the low quality buildings could not be replaced enough, the utility of distance function brings the two market equilibriums of the quality with the same length DK and KF. The equilibrium point D is located left side from the point C. In the low quality market, Figure 4 shows the upgrade but Figure 5 depicts the decline. In the Figure 5 the effect of innovation could not spread over all the regional space but appears in a limited area of the high quality. The unbalanced development of the region occurs actually. And the region suffers some serious urban problems to be solved.



Source: produced by Hiroshige Tanaka

Figure 5 Unconnected urban reform between the two markets

4. Experimental model analyses on the Tokyo Area

Tanaka (2013) develops empirical analysis of the spatial two markets model of Tanaka (1994) and demonstrates that the global financial crises from 2008 to 2009 affected the central business district more serious than the other regions in the Tokyo Area. Developing the theoretical approach we could expect to make clear how and what extent external or unprecedented impacts influence and spread in the region. Many surveys on the shrinking cities focus on the structural change of urban regions⁷. Although the population of Japan has tended to decline, the figures in Table 1 show that the Tokyo Area is an exceptional region to grow populations steadily. The Tokyo Area exhibits that some partial regions could improve but that entire area tends to shrink. The two markets analysis in the previous section conjunctures how an innovation of the high technology could compensate the damage from the decline of manufactures to degrade the urban structure. The replacement of main industries could make positive or negative prospects regarding the innovation in the social and economic systems and decreasing quality of the region.

⁷ Capello, R. and T.P. Dentinho (2012).

It is not certain that the revolutionary replacement of industries could uplift the shrinking urban space. We attempt to investigate how the two theoretical prospects make effect on the Tokyo Area. Since this market model analysis is applicable for regions with well constructed connectivity, the primal concern of this analysis is the connectivity between the high and low quality markets. It is assumed tentatively that objective regions should be divided into the two markets. The empirical research by Tanaka (2013) demonstrates that the regional average income per taxpayer is effective index for urban structural change in the less fluctuate regional economies. We suppose the border of the two markets should be 5000 thousands yen of municipality average income per taxpayer in 2014. 7 municipalities in the central region of Tokyo are classified in the high quality market and described in table 2⁸. This model suggests that the limit of the particular region could be moved by economic and social conditions.

From the experimental investigation of this model analysis the Central Region of Tokyo is supposed to be the most connective region in the Tokyo Area. The profits of social innovation are supposed to be shared in the entire the region equally.

Table 2 income per a taxpayer: Central Region of Tokyo

term(years)	thousands yen	thousands yen	2011)/(2014)	the two markets
municipality	March,2014	July,2011		
Minato	901.75	877.5	0.027	High quality market
Chiyoda	784.31	821.5	-0.047	
Shibuya	702.65	651.6	0.073	
Chuo	555.81	543.2	0.023	
Bunkyo	544.09	541.6	0.005	
Meguro	536.78	541.6	-0.009	
Setagaya	505.8	498.4	0.015	
Shinjuku	477.25	480.7	-0.007	Low quality market
Suginami	436.37	439.7	-0.008	
Sinagawa	427.41	423.7	0.009	
Ota	395.06	396.4	-0.003	
Toshima	411.63	404.6	0.017	
Nerima	394.98	397.5	-0.006	
Nakano	386.79	385.6	0.003	
Taito	385.48	390.8	-0.014	
Koto	389.17	386.4	0.007	
Itabashi	349.67	351.6	-0.006	
Edogawa	346.28	346.2	0.000	
Sumida	350.16	346.2	0.011	
Kita	343.68	343.1	0.002	
Arakawa	345.08	342.9	0.006	
Katsushika	333.11	331	0.006	
Adachi	324.18	323.6	0.002	

Source: city data pack 2015, Toyo Keizai Simpousha

The average income per tax payer rises in the both markets. The high quality market increase the income more in the high quality market 1.2% than in the low market 0.1%. According to the classification of Table 3, innovative industries seem to concentrate and

⁸ Setagaya is classified into the high quality market by an approximate estimate.

attract various development projects more on the Central Core District than the sub region in the Eastern Tokyo.

Proposition 1. The connective markets are constructed in the Central Region of Tokyo. The effects of social innovation are eminent in the high quality market. The influence on the low quality market appears positively in less extend. The Central Region of Tokyo performs the reform of urban structure exhibited by Figure 4.

In this paper the high quality market is defined to be the Central Core District. To investigate the connectivity of regions the two market analysis we should suppose some regions as the low quality markets experimentally. We select the regions of the low quality market as follows. Transferring some municipalities beyond the official classification of the prefectures, we construct 5 regions of the low markets imaginary in the Table 3. In the entire Tokyo Area the low quality market is the region where the central core district is excluded from the Tokyo Area. To understand the spatial relation easily the new integrated zonings are depicted by Figure 6.

Region , Municipality	Administrative members	Members to compensate the connected regions	Total after compensation
High Quality Market			
Central Core District	7	Minato,Chiyoda,Shibuya,Chuo,Bunkyou,Meguro, Setagaya	7
Low Quality Market			
Subregion in Eastern Tokyo	16	Shinjuku,Sugimami,Toshima,Nakano,Nerina,Itabashi,Kita,Arakawa,Adachi,Taito,Koto, Edogawa,Sumida,Katsushika,Sinagawa,Ota	16
Greater Western Tokyo	26	Shinjuku,Sugimami,Toshima,Nakano,Nerina and Eastern Tokyo	31
Greater Sitama	40	Shinjuku,Sugimami,Toshima,Nakano,Nerina,Itabashi,Kita,Arakawa,Adachi and Saitama	49
Greater Chiba	37	Taito,Koto,Edogawa,Sumida,Katsushika and Chiba	42
Greater Kanagawa	18	Sinagawa,Ota and Kanagawa	20
Tokyo Area of the low market	121	summation(Eastern Tokyo,Saitama,Chiba,Kanagawa)	114

Source: produced by Hiroshige Tanaka

The hypothetical investigations on the regional connection are targeted on the 7 pair districts :the Central core district vs. the Sub region in Eastern Tokyo; the Central core district vs. the Tokyo Prefecture; the Central core district vs. the Greater Saitama, the

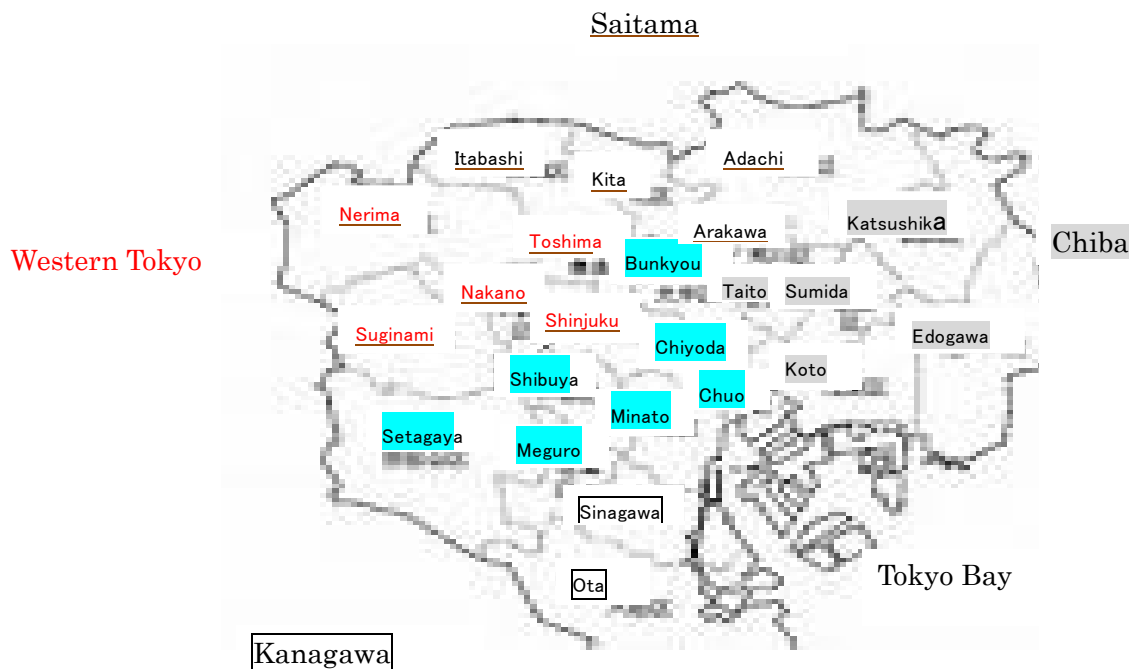


Figure 6 Division of the Central Tokyo for the analysis of regional Connection

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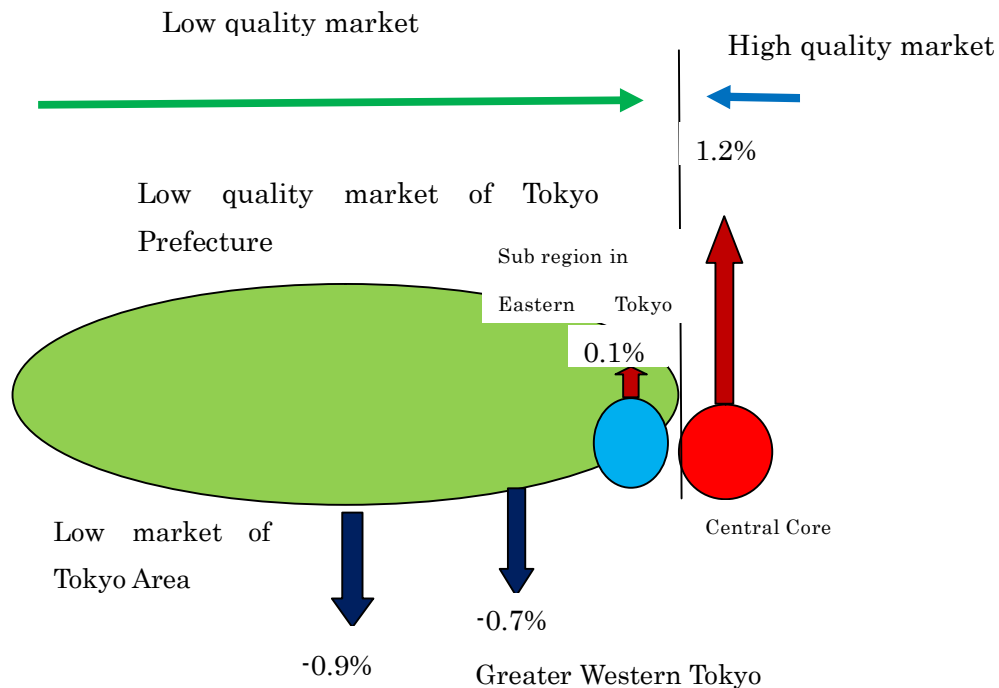
<http://www2m.biglobe.ne.jp/ZenTech/japan/map/data/Tokyo-23-district-Outline-Map.gif> (2016.6.21)

Central core district vs. the Greater Chiba; the Central core district vs. the Greater Kanagawa and the Central core district vs. the Tokyo Area of the low quality market.

Table 4 describes results of two markets analyses in the summary.

Table4 Connection of two markets		
region divided by the two markets	average income per tax payer	
	ten thousands yen	increment rate
	year 2014	between years 2014 and 2011
High Quality Market		
Central Core District	647.31	0.012
Low Quality Market		
Subregion in Eastern Tokyo	381.02	0.001
Geater Western Tokyo	370.41	-0.007
Greater Sitama	333.60	-0.008
Greater Chiba	322.53	-0.011
Greater Kanagawa	355.37	-0.009
Tokyo Area of the low market	339.11	-0.009

Source: produced by Hiroshige Tanaka by based on city data pack 2015, Toyo Keizai Simpousha



Source: produced by Hiroshige Tanaka

Figure 7 Connection of regions and innovation in the Tokyo Area

Table 4 makes clear two implications. Figure 7 illustrates the first implication. The connectivity effect with the central core district becomes weaker as we move to the left. And the intensity of the uplift reflects the connectivity with the core district. We could make certain the synergy effects of the Tokyo Area. At the same time, this positive research makes clear that the effects of connectivity is decreasing with the distance from the central core district as the main energy source of the Tokyo Area. Even if innovations in the central core district bring eminent power for the regional reform, the above findings show that the synergy effect of the Tokyo Area is propelled by many combined factors. We explain the investigation based on the statistical survey as proposition 2.

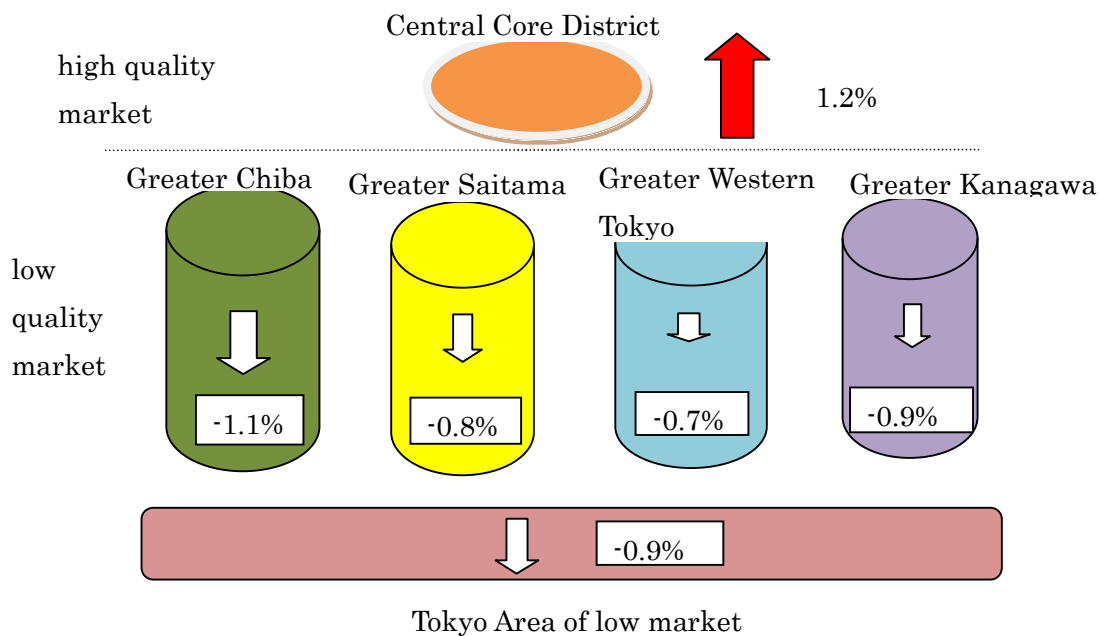
Proposition 2. The central core district raises apparently the economic and economic activities in certain limited regions by successful social innovation. The spreading effect of social innovation is decreasing regarding the connection with the central core district. This argument is supposed to state an illustrated urban reform in Figure 5.

Table 4 expresses that the enhancement of region is depend on the connection with the

central core district. Contrasting that Figure 7 surveys the urban reform in the way of central core district to the Western Tokyo, Figure 8 views distinguished regional characteristic among regions by applying this model analysis for all the Tokyo Area .

Proposition 3. So social innovation has effect of regional uplift positively, the region executes the projects to reform in both the high and the low quality markets.

Proposition 4. The connectivity of the Greater Chiba with the Central Core District is less than the other channel of regional integrations. The decline is settled within a range. The network mechanism of the Tokyo Area sustains all over regions of the Area.



Source: produced by Hiroshige Tanaka

Figure 8 Comparative Analysis of connection

5. Statistical test based on data analysis in the Tokyo Area

This section constructs some statistical foundations on Proposition 3 and 4. In the first, we compare the growth rates of population for pair regions in Table 5. Pairwise comparisons; the Central Core District between the Greater Western Tokyo, the Greater Saitama, and the Greater Kanagawa, do make any significant implications. The Central Core District shows apparently higher growth rate than the Tokyo Area of the low quality market in the regional populations. It should be noticed that the Greater Chiba is less growth rate of regional population than the Greater Western Tokyo.

	Central Core District	Tokyo Area of low market	Greater western Tokyo	Greater Chiba
average	4.43%	0.04%	0.61%	-0.63%
dispersion	0.06%	0.03%	0.01%	0.04%
P(T<=t) va	0.00% ***		0.32% ***	
t value	1.98		1.99	
z-statistics				
*** p<0.01, ** p<0.05, * p<0.1				

Source: produced by Chiharu Tanaka

The theory of the shrinking cities supposes that the synergy effects are likely to prevail in a relatively limited area as exhibited by Figure 1 and that urban regions of large scale should suffer from enlarging disparities as illustrated in Figure 2. The previous section 4 makes certain empirically that the theory of the shrinking cities could be adapted on the Tokyo Area. The wave of social innovation could upraise a part of urban region, however the decline should be ailing in other part of the region. Table 6 and 7 survey the vitalizing condition of inner regions in the Tokyo Area. Considering that the numbers of municipalities are different in the two regions, the Central Core District shows significant distinction from the low market of the Tokyo Area regarding growth of the average incomes (Table 6). That is, the Central Core District exhibits the significant performance in the growth of average income by comparing with regions in the low market of the Tokyo Area. However, Table 7 shows that any region in the low market of the Tokyo Area does not depict distinguished features of regional disparity significantly. It is supposed that the finely constructed network structure of the Tokyo Area could not reflect innovational vitalizations in a large scale of the regions but maintain firmly established economic and social system of the regional network.

	Central Core District	Low market of Tokyo Area
average	1.21%	-0.90%
dispersion	0.13%	0.01%
P(T<=t) value	0.01% ***	
t value	1.98	
z-statistics		
*** p<0.01, ** p<0.05, * p<0.1		

	Greater Western	Greater Saitama	Greater Western	Greater Chiba	Greater Western	Greater Kanagawa
average	-0.73%	-0.79%	-0.73%	-1.05%	-0.73%	-0.91%
dispersion	0.01%	0.02%	0.01%	0.02%	0.01%	0.01%
P(T<=t) value	82.18%		24.49%		51.17%	
t value	1.99		1.99		2.01	
	Greater Saitama	Greater Kanagawa	Greater Chiba	Greater Kanagawa	Greater Saitama	Greater Chiba
average	-0.79%	-0.91%	-1.05%	-0.91%	-0.79%	-1.05%
dispersion	0.02%	0.01%	0.02%	0.01%	0.02%	2.00%
P(T<=t) value	69.34%		66.24%		32.38%	
t value	2.00		2.00		1.99	

Source: produced by Chiharu Tanaka

Table 8 and 9 provide the clue to resolve the cause of the remarkable performance in the Central Core District. The expectation to improve economic and social activities must be supported by the urban reform project on the social and economical infrastructure of the region. Table 8 shows the number of urban reform projects in the municipalities of Tokyo Prefecture. The municipalities in Table 8 are classified into the Central Core District and the Greater West Tokyo defined in Table 4. Many projects listed in Table 8 are expected to promote urban structural change in the Tokyo Area. Table 9 makes encertain that the number of urban reform projects exshibite significant relation of regression with the average income per taxpayer of the muni-

Table 9 Single regression analysis of avarege income and urban reform projects manucipalities in Tokyo Prefecture	
regression coefficient	12.70 ***
(t-statistics)	(7.46)
intercept	354.15 ***
(t-statistics)	(21.43)
AR2	0.60
z-statistics	
*** p<0.01, ** p<0.05, * p<0.1	

Source: produced by Chiharu Tanaka

Table8 urban reform project and average income		
Municipality in Tokyo Prefecture	ten thousands yen income per tax payer (2014)	the number of Urban Reform Projects
Minato	901.75	30
Chiyoda	784.31	25
Shibuya	702.65	8
Chuo	555.81	25
Bunkyou	544.09	12
Meguro	536.78	4
Setagaya	505.8	5
Shinjuku	477.25	27
Toshima	411.63	9
Nerima	394.98	5
Nakano	386.79	12
Hachioji	346.7	3
Tachikawa	352.27	4
Musashino	479.87	4
Mitaka	413.56	2
Ome	315.23	2
Fuchu	374.42	2
Akishima	324.84	0
Choufu	390.58	4
Machida	376.27	4
Koganei	406.24	1
Kodaira	375.94	2
Hino	359.3	0
Higashi Murayama	339.44	1
Kokubunji	415.15	3
Kunitachi	427.37	0
Fussa	307.69	0
Komae	366.65	1
Higashi Yamato	331.91	0
Kiyose	330.9	1
Higashi Kurume	346.55	0
Musashi Murayama	304.29	0
Tama	358.24	1
Inagi	386.31	0
Hamura	324.86	0
Akiruno	313.1	0
Nishi Tokyo	373.83	3

Central Core District
Greater Western Tokyo

Source: Wikipedia 'survey of urban reform projects in Tokyo Prefecture

<https://ja.wikipedia.org/wiki/%E6%9D%B1%E4%BA%AC%E9%83%BD%E3%81%AE%E5%86%8D%E9%96%8B%E7%99%BA%E3%81%AE%E4%B8%80%E8%A6%A7> (2016.7.1)

cipality. The projects mainly aim at transformation of social infratrucure and could foster social innovetions to replace main industries. The urban reform projects based on the public private partnerships could not cover larege area of region but should appear to concentrate on a relatively small regions.

6. Concluding Remarks

The shrinking city could be observed as the regional feature that might occur in the globalized economies and emerging industrial revolution. So many urban issues are related with the phenomena of the shrinking city. The hypotheses of shrinking cities forecast the replacement of industries and reconstruction of social infrastructure in the urban regions. Figure 1 and 2 based on the two markets model of Tanaka (1994) and (2013) state that the region should be faced with the two possibilities. In one case, an intensive revolution in the industries induces a large scale of spreading effects and improves regional economic and social structure. The other situation, ineffective revolution on the region shows only in the limited area and the excess supply of the building is remaining to decline the regional performance and infrastructure. Many urban regions are forced to decide their own way among some choices. Empirical investigation makes clear the feature of the transformation for the region. This paper presents a prototype of the analytical method on the Tokyo Area. The method is applicable on appropriate reconstruction for many other urban regions.

The replacement of industries is triggered by innovation of technologies in information and communication, environment and finance in the post industrial society. The progressive industries could attract funds for investment and vitalize regional economies. Successful fundraising from the private capital market could accelerate improving reform of the region. New types of industrial revolution as well as enlarging globalization of economies might cause to decline the industries. Consequently, replacement of industries will be more likely to happen pervasively in the urban area. The revolutionary progress is not limited in the field of economics but brings comprehensive urban issues.

Although the innovation of industries makes effects on the regional development, the connectivity within regional municipalities contributes greatly the sustainability of region. This empirical research make focus on the steps to improve regional structures. The network mechanism could improve stability and sustainability of the region. In the first, the development projects have invested a great amount of funds concentrically on the core region by employing new method of fundraising. In the second, the spreading effect of each project seems to be available within limits. But the innovation increases the projects consecutively. And the synergy of various projects uplifts the vitality of the region. Consequently, we should investigate the mechanism that the heightened vitality in the core region influences on the economic activities in the connected regions.

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