Yasushi Asami
Yoshiro Higano
Hideo Fukui   *Editors*

Frontiers of Real Estate Science in Japan

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Yasushi Asami • Yoshiro Higano • Hideo Fukui
Editors

Frontiers of Real Estate Science in Japan

Editors
Yasushi Asami
Department of Urban Engineering
University of Tokyo
Tokyo, Tokyo, Japan

Yoshiro Higano
Faculty of Life and Environmental Science
University of Tsukuba
Tsuchiura, Ibaraki, Japan

Hideo Fukui
Urban Policy Program
National Graduate Institute for Policy
Studies
Tokyo, Tokyo, Japan

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Part I
Real Estate and the Legal System

Chapter 1
Real Estate and the Legal System of Japan

Hideo Fukui

Abstract In Part I, entitled Real Estate and the Legal System, we analyze owner-unknown land issues, land acquisitions, and real estate auctions.

The use and value of real estate such as land and buildings are significantly affected by public laws and regulations related to urban planning and construction, the environment, and taxation; for example, contract laws such as the Act on Land and Building Leases; private laws regulating torts, collateral enforcement, and so on; tax laws that regulate transfer taxes, ownership taxes, and transaction taxes; and regulations surrounding land use and urban infrastructure development. This paper discusses, therefore, the relationships between these laws and real estate, identifies problems in the laws associated with real estate in Japan, and proposes improvements.

First, in recent years, owner-unknown land issues have become a serious concern in Japan. The Japanese registry does not always reflect the actual rightful owner, primarily because such registration is only a perfection requirement in civil law and registration involves a great deal of time and money. For example, because a large extent of land is registered to owners from nearly 100 years ago, it has changed hands many times through inheritance, which means that today, it is extremely difficult to determine the actual owner (inheritor) without spending a great deal of time and money. However, if the profits to be obtained from the land do not justify such expense, the land remains unused as "owner-unknown land."

Buying and selling land under Japanese civil law requires an agreement from all landowners including in the case of shared ownerships; therefore, even if the land has high returns, if it is "owner-unknown land," it cannot be used effectively. With a focus on unknown-owner land, in this section, four writers provide multifaceted perspectives on the causes thereof, the defects in the current system, and the possible solutions.

Eminent domain, the system which allows the acquisition of land against the land owner's will for public projects, is widely institutionalized in many countries. It

H. Fukui (✉)
National Graduate Institute for Policy Studies, Minato-ku, Tokyo, Japan
e-mail: fukui@grips.ac.jp

works to mitigate the owner-unknown land issues as far as lands are acquired by public projects.

Further, real estate auctions are often held when liens are placed on land and/or residences for housing loan defaults. The Japanese civil auction system, which was institutionalized at the end of the nineteenth century, stipulates that a tenancy that is behind on a mortgage may resist a purchase unconditionally as long as the mortgage default period is within 3 years (short-term lease protection system/former Civil Code Article 395). This system was intended to avoid the unstable use of mortgaged properties and to promote the effective use of real estate; however, because the majority of users and the beneficiaries of this system were in fact anti-social groups, it was used to demand money unjustly from debtors and buyers, thus preventing the effective use of the mortgaged properties.

When the protection of short-term leases was abolished in 2004, these types of interferences are said to have decreased drastically. However, successful bids for auctioned real estate properties continue to be lower than in general transactions. Therefore, here, we provide a quantitative analysis of these situations and propose further auction system improvements.

Below, we introduce the outlines of each theory in Part I.

1.1   Iwasaki (2020)

This paper describes how and why owner-unknown lands have been increasing in Japan's shrinking population and proposes some ideas on the solution to the relating legal issues. Even for land with economic value, there is no great sense of need to register the name and address of the owner when that land is used for an intended purpose or for revenue, and even through there may be an occupant, the true owner may be unknown. In this case, it is possible to consider measures to resolve the problem caused by the owner being unknown through tax procedures and collection procedures. For land that has lost its economic value, however, the only way to transfer the control to the government or a public organization is to establish new forcible execution measures under administrative law. And in parallel with such compulsory measures, there should be measures to proactively promote the donation of land, needed for transport, disaster prevention, and public use, that is of public interest to the government of public organizations.

1.2 Nakagawa (2020)

The problem of land with unknown ownership is becoming increasingly evident. This paper examines the need for the titling system using perspectives from economics and considers what sorts of titling system works for which types of society.

A series of previous researches categorize the titling systems used in many advanced countries as either registration systems or recording systems. Japan's titling system is categorized as a recording system. However, since the details of registered information are confirmed through various registration procedures, the system also has aspects that resemble a registration system. This can be interpreted as having selected the titling system's strength that considerably lowers the level of litigation risk. In that case, transaction costs become very high.

The result of selecting the recording system in Japan, which is a system with a very high strength, could explain why nobody takes insurance to cover the risk of title litigation.

In Japan, it is highly likely that the unreversible population decline, low birth rate and aging population will lower the profitability of land. In that case, a titling system with low strength is likely to be the best for society as indicated in the analysis above.

1.3 Fukui (2020)

The increase of land plots with unknown owners, that is, land plots whose owner's name and address are not easily identifiable through repeated inheritance, etc., emerges as an imminent social issue.

The big reason for this phenomenon is the civil code which unconditionally allows sharing of real estate by unlimited number of joint owners, for one thing, and the registration system of real estate which does not require the true owner to register and thus does not show real rights of real estate, for another.

To reduce the increase of land plots with unknown owners as a proactive measure and to utilize them as a reactive measure, it is necessary to set up the one-owner principle with the ban of the sharing of real estate even through inheritance, to abolish fixed asset tax on buildings and houses, to require the new owner of real estate to register the right upon the transfer of ownership and for the registration office to make it public, to amend the Land Expropriation Act to facilitate the purchase of the land plots for public purpose without the owner identification, to create the institutional arrangement which allows to fictionally replace the will of the owner, to amend the civil code to allow the disposal of shared real estate by the majority of the joint owners.

1.4 Yoshihara (2020)

In recent years, because of the time needed to identify landowners, there have been several cases in Japan that have interfered with measures to recover from disasters, to eliminate abandoned farmlands, and to prevent vacant houses. The authors focused on property tax in basic municipalities to quantitatively understand this situation, conducting a questionnaire survey with the tax bureaus in all municipalities and Tokyo Prefecture (23 wards). By examining the seriousness of the problems caused by unregistered inheritance, which is a major factor causing "unknown owners," on the practice of property tax, we aimed to indirectly understand the problem of "unknown owners." The social and systematic factors behind this issue are summarized in this paper based on the survey results (responses from 888 municipalities in Japan: recovery rate of 52%), concluding that as long as the system remains as is, this problem will inevitably grow as the population declines. Therefore, it is recommended that measures be urgently introduced to promote timely inheritance registrations, the preparation of "receptacles" for land having no use plans, and the preparation of a land information infrastructure.

1.5 Ohya (2020)

This study examines the negative factors in the designing legal system that lead to "administration failure" that impedes the social welfare related to the grant and approval of the business project from the case of land acquisition in Malaysia in ASEAN countries. Malaysia has introduced a land acquisition system for profit-oriented enterprises since 1991 with the aim of economic growth to reduce poverty and secure resources for income redistribution. The author theoretically analyzes the negative impacts on the implementation of economic policy when the operation of land acquisition for profit-oriented enterprises and bribery are linked and what kind of factors it depends on in the legal system design. In conclusion, the author extracts three common negative effect factors in the design of legal system related to the grant and approval of the administration that impair social welfare. First, the provision of the constitution within the limits of the law increases the degree of freedom of legislation and gives the administration broad discretion (flexible discretion). Second, for administration to have wide discretion, the administration can make decisions that have a negative effect on the accomplishment of the policy goals and decisions that undermine the public's credibility. Third, such administrative decisions that have a negative effect on the fulfillment of policy goals are elicited through bribery that seeks to exploit administrative authority having broad discretion. These factors impede the role that the administration should play in order to maximize social welfare by bribery to an administration that has the authority to grant and approve business.

1.6 Ooka (2020)

This paper shows the effect of a series of system revisions of judicial real estate auction in the 2000s on three factors; bid acceptance ratio, number of bidders, and highest bid.

For some time, it is said that the sale price by the judicial real estate auction was always low in comparison with general real estate trading because of the institutional defect of judicial real estate auction system. The correction of difference of the sale price brings profit to the creditor and the debtor, as well as, it may be said that it is the important policy problem that can be connected for the activation of the real estate finance market by drop of the lending rate through the improvement of the collateral property value.

He conducted empirical analysis using multi-year data of judicial real estate auction and general real estate trading. I clarified that bid acceptance ratio, number of bidders, and highest bid were improved considerably by a series of system revision of judicial real estate auction; on the other hand, the price differences between judicial real estate auction and general real estate trading was far more than 30%. In addition, based on these analysis results, I consider that the problem to be left in the current system of judicial real estate auction bringing about the price difference, and suggest about necessity of further system revisions.

Chapter 2
Legal Issues of Land Plots with Unknown Owners

Masaaki Iwasaki

Abstract This paper describes how and why owner unknown lands have been increasing in Japan's shrinking population and proposes some ideas on the solution to the relating legal issues.

2.1 Introduction

2.1.1 *The Social Problem Created by Real Estate with Unknown Ownership (Vacant Premises and Abandoned Land)*

Real estate for which the owner cannot be immediately identified through owners' ledgers such as the register or for which contact cannot be made even if the owner has been identified is referred to as real estate with unknown ownership. Jurally, real estate with unknown ownership has two meanings: owner of building and owner of land are unknown in the above definition.

The specific details of 'unknown' cover various cases such as being unable to identify the current owner because the registered information in the various ledgers is old and out of date, where even if the owner can be identified, the owner's whereabouts is unknown (because the owner has moved or has a new address), there being multiple heirs following the death of the registered holder of the title deed and the registration of the transfer of ownership has not been possible due to not

M. Iwasaki (✉)
School of Law, Meiji University, Tokyo, Japan
e-mail: iwasaki_m@meiji.ac.jp

knowing about all of the heirs, and in the case like communal land (commonable iri-ai-chi (commonable land), etc.), where not all joint owners are listed in the owner's ledger.[1]

The various problems arising from such real estate with unknown ownership have existed for a long time. They have become evident at times of agrarian reforms, land readjustment projects, land redevelopment projects, etc. and whenever social problems emerged such as concerns about foreigners' buying up of water sources in mountainous regions.

Of particular note has been when there have been reconstruction projects that encouraged land redevelopment and migration following the Great East Japan Earthquake, real estate with unknown ownership attracted attention because it presented an obstacle for acquisition and reconstruction projects.[2]

The amount of real estate with unknown ownership tends to increase after the collapse of the bubble economy around the 1990s since real estate not directly used becomes 'negative' property because of maintenance and management costs due to the disillusion by the myth that land price continues to increase forever. According to calculations by 'The Working Group on the Problem of Land plots with unknown owners (Masuda Working Group)', the area of Land plots with unknown owners in Japan is reportedly even now to be on a par with the total area of Kyushu.[3]

2.1.2 Problems in Terms of Administrative Law, Tax Law and Civil Transactions

When undertaking various types of public works, surrender and use/expropriation in accordance with the Expropriation of Land Act become difficult if there is real estate with unknown ownership. Regarding small uncertified projects, it is difficult to process in accordance with the Expropriation of Land Act, so nothing can be done in the case of real estate with unknown ownership.

Collection of fixed assets tax and inheritance tax has been imperfect for real estate with economic value. Real estate that is only valued at below the tax exemption limit for fixed assets tax (mountain forests, wilderness, etc.) is neglected. There are also concerns that an heir of inherited property will neglect to register the inheritance,

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[1]For examples of specific detail, see the Working Group on the Problem of Land plots with unknown owners (Chairman, Hiroya Masuda), 'Interim Report of the Working Group on the Problem of Land plots with unknown owners', dated June 2017 (hereinafter, the 'Interim Report'), p. 5–8.

[2]For case studies looking at the problem of real estate with unknown owners, see Shoko Yoshihara '*Land Issues in the Era of Depopulation*' (Chuko Shinsho 2446) Chaps. 1, 2, 3, Tokyo Foundation for Policy Research (Shoko Yoshihara, Research Fellow), '*Shift towards Land plots with unknown owners—status of the problem indicated through survey of local governments*' (Tokyo Foundation 2016) Survey Results.

[3]Interim Report, ibid (1) p. 17.

which means preterition in the calculation of tax for inheritance tax; but this is not easily detected.

When there are redevelopment projects by private developers, matters cannot be processed with legal force, so real estate with unknown ownership becomes a major obstacle and can cause enormous economic loss.

2.1.3 Enactment of the Special Measures Act on Vacant Premises

'Act on Special Measures to Forward Municipalities' Moves for Vacant premises' (Act No. 127 of 2014), the so-called Special Measures Act on Vacant Premises, has been enacted and enforced in relation to property with unknown ownership, which finally draws a start to finding a resolution for real estate with unknown ownership. In this Act, property with unknown ownership is split into 'vacant premises, etc.' and 'designated vacant premises, etc.' according to the so-called level of risk, with corresponding measures.

Under this Act, vacant premises that have not been managed appropriately and have serious negative impact on local residents, such as related to disaster prevention, hygiene and presentation of the vacant premises, etc., are required to take measures to protect the life, body and property of local residents, to protect the living environment, to utilize the vacant premises, etc. (Article 1 of the Act). Note that the Act came into effect on February 26, 2015 (and May 26, 2105, for compulsory execution). According to studies undertaken in preparation of the establishment of this Act, there were estimated to be about 8.2 million vacant premises nationwide as of 2013. Four hundred one local governments have reportedly enacted ordinances for vacant premises as of October 2014 in response.

'Vacant premises, etc.' refer to 'buildings or structures incidental thereto that in their normal state are not used as residence or for other related purposes, and the sites thereof (including standing trees and other articles fixed to land)' (Article 2, paragraph (1) of the Act). The relevant measures for 'vacant premises, etc.' include promotion of appropriate management and administrative guidance and the valid use of administrative guidance including formulation of measures vis-à-vis the vacant premises by municipalities, a survey of the address and owner of vacant premises, etc., internal use of information for fixed assets tax and the preparation of a database of owner's information.

On the other hand, 'designated vacant premises, etc.' refer to vacant premises, etc. in (1) a situation where there is considerable concern about the danger in terms of security such as a collapse, (2) a situation where there is considerable concern about prospective harmful effects on health, (3) a situation where there has been considerable damage to the scenery due to the lack of appropriate management and (4) other inappropriate situations due to neglect in preserving the surrounding lifestyle environment (Article 2, paragraph (2) of the Act). In terms of measures to

deal with 'designated vacant premises, etc.', the local government with jurisdiction is now able to take forcible actions such as onsite inspections, give advice, instructions, recommendations and orders to implement measures such as disposal, repair, felling of standing bamboo and trees, and demolition through administration by proxy (Article 14 of the Act).

These measures can be implemented where the owner of the vacant premises, etc., and the designated vacant premises, etc., has been identified. However, where the owner is unknown or uncontactable, it is not clear if it is possible to proceed in line with the hoped for purpose. In this regard, the Special Measures Act for Vacant premises is merely the starting line and not the goal for resolving property with unknown ownership.

2.1.4 Discussion Concerning Measures to Deal with Land Plots with Unknown Owners Such as Abandoned Land

By contrast, nothing has yet been legislated in relation to measures pertaining to Land plots with unknown owners such as abandoned land. Discussion is currently progressing at relevant administrative agencies, the Liberal Democratic Party, the government and private research associations.

First, as an initiative within the Ministry of Land, Infrastructure, Transport and Tourism initiatives, (1) Since April 2015, the 'Working Group on policies to deal with land for which the whereabouts of the owner is difficult to find (Akio Yamanome, chairperson)' has been investigating measures focused on promoting land expropriation and issued 'Guidelines for searching and utilizing land for which the whereabouts of the owner is difficult to find' in March 2016. The guidelines were further revised in March 2017 (Version 2).[4]

The National Land Council's Land Policy Committee also started to investigate the problem of Land plots with unknown owners, which led to the establishment of the 'Working Group on new uses for vacant land, etc. (Akio Yamanome, Chairperson)' in January 2017, which released a report in June that year.[5] In addition, the Ministry of Justice investigated from October that year through the 'Working Group on Case Studies concerning the maintenance and management of jointly-owned private roads (Hiroshi Matsuo, chairperson)' and the 'Working Group concerning the approach to the titling system and land ownership (Akio Yamanome, Chairperson)'.

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[4]Working Group on policies to deal with land for which the whereabouts of the owner is difficult to find, 'Guidelines for searching and utilizing land for which the whereabouts of the owner is difficult to find' (March 2017) www.mlit.go.jp/seisakutokatsu/iten/shoyusha.guideline.html.

[5]This can be found by searching on the following Ministry of Land, Infrastructure, Transport and Tourism website. www.mlit.go.jp/report/press/totikensangyo02_hh_000100.html.

The next initiative by the government and the Liberal Democratic Party (LDP) was first the establishment of a Congressional Panel (Okiharu Yasuoka, Chairperson) within the LDP from October 2016 and a proposal that was put forward in April 2017. Subsequently, the 'Special Committee of the Policy Research Council of the LDP (Takeshi Noda, Chairperson)' commenced investigation that month from the perspective of promoting public works projects, with the release of an interim report dated June 1, 2017. The government also investigated from February 2017 through the Council on Economic and Fiscal Policy's Committee for Promoting the Integrated Economic and Fiscal Reforms (National and regional systems Working Group), etc. In response to these government and Liberal Democratic Party initiatives, the 'Basic Policies for Economic and Fiscal Management and Reform 2017: Investments for the Future Strategy 2017', or the so-called Basic Policies, were approved by the Cabinet on June 9, 2017, which incorporated measures that should be promoted to address Land plots with unknown owners.

Furthermore, in terms of private research associations, the 'Working Group on the Problem of Land plots with unknown owners (Hiroya Masuda, Chairperson)' was launched in January 2017, with an interim report released on June 26 of that year. Apart from this, the Japan Association for Real Estate Sciences, the Association of Urban Housing Sciences and the Japan Association for Property Assessment Policy jointly established the 'Working Group on Land plots with unknown owners (Masaaki Iwasaki, Chairperson)' in August that year, which is investigating such matters.

2.2 Why Does Land Plots with Unknown Owners Arise?

2.2.1 The Potential Number of 'Unknown' Owners Is Very Large

There are cases where the existence of the owner is unknown and cases where the owner has been identified, but the relationship of rights is unclear, and it is not possible to identify the true owner.

'The existence of the owner is unknown' includes not only an investigation of the owners' ledger such as the real estate register, but also when it is not possible to identify the whereabouts of the owner even having done a site survey.

'The relationship of rights is unclear' includes the situation where there has been a large increase in the number of heirs due to the passage of time during which the inheritance register has not been completed over a number of generations of heirs, so it has become unclear who has inherited what portion of land, and the situation where the land cannot be disposed of without agreement of all related parties as in the case of a community property or a common land.

Since the potential number of such 'unknown' owners does not become evident until there is a need such as the sale of the land, the numbers can become quite large.[6]

2.2.2 The Impact of Dilution of Family Relationships and Increase in Wastelands and Abandoned Land with Unknown Owners

There are cases where even relatives have not had the opportunity to meet face to face, and even the relevant parties do not know their mutual legal relationship. Consequently, it becomes very difficult to progress the discussion about splitting inherited property. Furthermore, the relationship between relatives has been further diluted through successive divorces and remarriages, while confidentiality creates complications for inheritance. Since splitting inherited property is difficult, someone may continue to occupy the inherited land, yet to whom the land belong to may not be known.

The above changes in family relationships mean a likely increase in the number of cases where the owner is unknown.

2.2.3 The Impact of Urban Concentration of Population and Industry: The Decline in Land Prices and Absence of Transactions in Regional Areas

As for land with economic value, there may be people who want to acquire the ownership of such land even if there is the burden of taxes such as real estate registration tax levied at the time of inheritance, real estate acquisition tax and fixed assets tax.

However, few people want to acquire the ownership of land where the economic value does not cover the various costs and tax burdens associated with such inheritance.

The rate of real estate ownership on a household basis continued to increase during the high growth period from the mid-1960s, so on average more than 60% of households and about 80% of middle-aged and above households own real estate.[7] In addition, there has been pronounced concentration of population and industry

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[6]Interim Report. Ibid (1) pp. 10–17. *See* Yoshihara, Ibid (2) Chap. 2, The Tokyo Foundation for Policy Research, Ibid (2) pp. 9–25 for the results of the survey of local government entities.

[7]Statistical data can be retrieved from the Statistics Bureau, Ministry of Internal Affairs and Communications website. Current data is based on the 2013 survey. www.stat.go.jp/data/jyutaku/2013/10_3.htm.

towards three major cities (Tokyo, Osaka and Nagoya) since the beginning of the Heisei era, at the end of the 1980s.

Therefore, subsequent generations of children and grandchildren work in the city, and if they own a residence there, they do not necessarily have a desire to acquire their parent's real estate in regional areas. In addition, there is a declining birth rates so there is also a decline in the number of persons in a position to take over the real estate of the parent's generation.

If the real estate can be sold, it could be sold after being registered on the ownership transfer register when inherited, but given the progress in urban concentration of population and industry, there are few land sales in regional areas. Therefore, the process of registration is neglected to avoid the burden such as the real estate registration tax, real estate acquisition tax, fixed assets tax, etc. that arise from ownership transfer. For example, there seem to be cases where heirs have agreed to exclude real estate from inherited property (i.e., also not register the transfer of ownership due to inheritance) to avoid inheritance tax. It is not easy to identify such properties that are excluded from inheritance as agreed to by heirs.

2.2.4 Emergence of New Inheritance Problems: Real Estate Put in Storage Due to Elderly Inheritance and Inheritance Disputes

Increased longevity means people are inheriting property at an increasingly older age. In the case of elderly inheritance, the heirs tend to neglect the inherited property due to a lack of desire, need and capacity to manage and maintain the inherited real estate. For example, even though the amendments to the Inheritance Tax Act allow for inheritance by grandchildren, the need for grandchildren to require real estate in regional areas that is not required by the parent's generation is not going to change, so this does not provide a fundamental solution.

On the other hand, claims to rights among heirs have intensified for real estate with economic value, so cases exist in which no progress has been made in terms of splitting inherited property. Selling inherited real estate to resolve the splitting of inherited property with disbursement of the proceeds resulted in taxation in the form of 'deemed capital gains' that was an impairment to such selling. So, partial amendments to legislation related to the enactment of the so-called Special Measures Act on Vacant Premises were implemented to prevent the capital gains tax from becoming unreasonable, and this mitigated such impairment a little.

That is, special measure for special tax exemptions on capital gains pertaining to vacant premises was established in accordance with the FY2016 tax system amendments as follows:

In the case of transfer of residential property between April 1, 2016, and December 31, 2019, by an heir or a person who acquires residential property through a bequest that (1) is the ancestor's residential property and the land that is provided

to be used as the site thereof that is deemed to comply with certain requirements, or (2) the land that is used as the site following the disposal of such ancestor's residential property that is deemed to comply with certain requirements, apart from where the compensation for such transfer exceeds 100 million yen, the transfer costs pertaining to such transfer shall be subject to special exemption of 30 million yen in capital gains on the residential property (Article 35, paragraphs (3) through (10) of the Act on Special Measures concerning Taxation).

Although this is temporary legislation, it is expected to have an impact.

2.3 Why Must the Issue of Land Plots with Unknown Owners Be Resolved?

2.3.1 Impact of Change in Family Relationships: Incomplete Management Due to Increase in One-Person Households Comprised of a Young or Elderly Person

A trend in recent years has been in the increase in so-called one-person households comprised of younger generation or the elderly generation. People who live by themselves face a particularly heavy burden in maintaining and managing real estate.

There are fears that incomplete management of Land plots with unknown owners will cause concern for the health and security of nearby residents. In this regard, Land plots with unknown owners can no longer be called private property, and it has a strong sense of being public property in nature.

2.3.2 Impairment on Public Works and Economic Activity

Public works that are certified by legislation are projects necessary for public welfare. Even so, the inability to proceed is a major loss to the entire nation.

Public works for hazard prevention such as preventing major disasters caused by earthquakes, wind and flood damage, etc. have aspects that inevitably require forcible execution measures to deal with Land plots with unknown owners.

In addition, if regional improvements depend on national and regional public bodies, they tend to be delayed due to budget constraints. So there needs to be proactive promotion of redevelopment by private companies of Land plots with unknown owners that has economic value. On this point, it is useful to refer to the method of land banking used in the United States.[8] That is, a system needs to be

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[8]The 'Working Group on new uses for vacant land' also raised the issue about the need for a Japanese version of the land bank, and this is included in the matters for consideration in 'The Investments for the Future Strategy 2017', which was formulated by the government on the back of

developed where corporations in which regional public organizations participate can acquire and hold land that is not being effectively utilized, with the relationship of rights clarified and the land leased or transferred to the private sector.

2.3.3   Problem of Collecting Fixed Assets Tax, Inheritance and Gift Taxes Pertaining to Land Plots with Unknown Owners

The owner listed in the register of lands and buildings or in the tax ledger as of January 1 each year is levied fixed assets tax as the taxpayer, even for Land plots with unknown owners. This tax notice is sent to the address of such taxpayer, but a considerable amount is returned as non-delivered mail.[9]

Fixed assets tax is a financial resource necessary for local administration, and it is also allocated towards the cost of maintaining order in the area under jurisdiction. Therefore, when collection of the fixed assets tax from the unknown owner remains impossible, it becomes a life-and-death problem for the regional public organization.

On the other hand, the owner who neglects the land is shifting the economic cost required for maintenance and management of such owner's estate to other residents, in the same way as being in receipt of excess profits.

One cannot shut one's eyes to the inability to collect fixed assets tax from the perspective of beneficiaries-pay principle of local taxes.

In the case of inheritance and gifts, if the ownership transfer is registered, such registered information is conveyed to the relevant Tax Office, with such information becoming tax documents for inheritance tax and gift tax. However, if the heirs and recipients arbitrarily neglect to register the ownership transfer from inheritance and gifts (registration is merely a requirement of perfection under the Civil Code and is also not an obligation), it becomes difficult to detect the fact of the inheritance or gift, making it easy to avoid paying tax.

the 'Basic Policies for Economic and Fiscal Management and Reform 2017 (Basic Policies 2017)', released on June 9, 2017. In terms of reporting on the American system, see Miho Maene, Yoko Shimizu and Toru Nakayama 'Research on business of vacant premise measures in the United States of America—About Flint, Michigan and Youngstown, Ohio', Reports of the City Planning Institute of Japan, No. 9, May 2010, pp. 27–30 and Yasuyuki Fujii 'The Detroit Land Bank Authority's Efforts to Cope with Vacant and Abandoned Properties in Targeted Neighborhoods', Journal of the City Planning Institute of Japan, Volume 50, No.3, 2015, pp. 1032–1038.

[9]*See* the Tokyo Foundation for Policy Research, Ibid above (2) pp. 9–25 for the survey results.

2.4 How Can the Problem of Land Plots with Unknown Owners Be Solved?

2.4.1 Policies to Deal with Land That Has Economic Value

Land with economic value that is anticipated to be sold will be at a disadvantage unless the owner's name and address are registered regardless of whether it is inherited or a gift or an act caused by sale or other private law, so there is not much concern about the owner of such land being unknown.

Nevertheless, even for land with economic value, there is no great sense of need to register the name and address of the owner when that land is used for an intended purpose or for revenue, and even though there may be an occupant, the true owner may be unknown. In this case, it is possible to consider measures to resolve the problem caused by the owner being unknown through tax procedures and collection procedures. That is, first, measures should be considered that facilitate the compulsory collection of Land plots with unknown owners following the service of notice by publication as a procedure to deal with default on the payment of fixed assets tax if the tax notice for the fixed assets tax is dispatched and if non-delivery notices continue to be received for a certain period.

Second, if the person registered as the owner in the register or the tax ledger or the person who is registered is unknown, the provisions in Article 343, paragraph (2), latter clause of the Local Tax Act, should be revised to enable the collection of fixed assets tax from such land or building as the tax payer 'as the current owner', regardless of to whom it belongs.

According to the judgement of the Supreme Court dated July 17, 2015, strict investigation and identification of the ownership must be conducted even in this type of case, but this is forecast to be very difficult in practice.[10]

Third, there is a plan to make sure registered applications have a so-called common number and that registration of ownership transfer becomes an obligation with offenders levied with a fine. However, while measures to require registration of ownership transfer may have a certain level of effectiveness in preventing the omission of owned real estate, at the granular level, with only something like a fine, this does not appear to provide people who do not sense a need to register with incentive that forces them to register.

On the other hand, it may also be necessary to have incentive measures under the tax law that promote the transfer of ownership.

For example, as consistent with amendments to the system for deductions from income under the Income Tax Act, this could include the introduction of deductions of tax amounts with benefits together with the application of deductions on donations to promote donations of unneeded real estate to the government and public organizations. In this way, people with low incomes such as the elderly and

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[10]Masaaki Iwasaki, 'Case Commentary' *Jurist Special Edition* 'Commentary on major cases for 2015' (Jurist No. 1492), pp. 201–202.

pensioners could benefit from a negative taxable income through the donation of unneeded real estate. This would increase the burden of land management cost of the national government, but would most likely substantially reduce the amount of Land plots with unknown owners.

2.4.2 Measures to Deal with Land That Has Lost Its Economic Value

For real estate that is valued below the tax exemption limit on fixed assets tax (the tax reference amount for the appraisal value is 300,000 yen for land and 200,000 yen for buildings: Article 351 of the Local Tax Act), the method for default procedures pertaining to fixed assets tax will not work. It is difficult to resolve the problem of Land plots with unknown owners with the above tax procedures and collection procedures.

Therefore, for land that has lost its economic value, the only way to transfer the control to the government or a public organization is to establish new forcible execution measures under administrative law. There is likely scope to establish a system that recognizes certified projects even if there is no plan for public works in order for the Expropriation of Land Act to apply.

On the other hand, in parallel with such compulsory measures, there should be measures to proactively promote the donation of land that is of public interest to the government or public organizations (land needed for transport, disaster prevention and public use). This would increase the land management fees for the government and public organizations, and that burden would ultimately need to be borne by citizens and residents through taxation. However, national property and property of public organizations are the property of citizens and residents, so it is only natural that they should bear the maintenance and management fee. This is much more logical than the current situation where the maintenance and management fee of private property that is Land plots with unknown owners is borne through tax revenues.

Note that even for the government and public organizations, approval of excessively large donations of unneeded and non-essential real estate would incur considerable cost and effort for its management that would eat into the budget, so some cases may be inappropriate for the national economy. As such, it might mean that real estate not needed for public purposes where the owner is not evident in places such as expansive mountain forests and wilderness areas may end up being neglected. Even if neglected, there is little concern of such land being acquired by foreign owners for example given the fact that the ownership is unknown. This suggests there is no near term danger, but whether or not it is right to neglect mountain forests and wilderness areas that have gone to ruin is a problem that should continue to be investigated as part of the overall approach to national land management.

Chapter 3
The Efficiency of the Titling System: Perspectives of Economics

Masayuki Nakagawa

Abstract The problem of land with unknown ownership is becoming increasingly evident with Japan's declining population, low birth rate and aging population. This paper examines the need for the titling system using perspectives from economics and considers what sorts of titling system works for which types of society and looks at ways to deal with the problem of land with unknown ownership. A series of previous researches such as Miceli et al. (Eur J Law Econ 6:305–323, 1998; J Urban Econ 47:370–389, 2000) categorize the titling systems used in many advanced countries as either registration systems or recording systems. In terms of broad categorization Japan's titling system is categorized as a recording system. However, since the details of registered information are confirmed through various registration procedures, the system also has aspects that resemble a registration system. This can be interpreted as having selected the titling system's strength that considerably lowers the level of litigation risk. In that case, transaction costs become very high. This could be the cause of the excessively small current level of Japanese real estate transactions. Furthermore, the result of selecting the recording system in Japan, which is a system with a very high strength, could explain why nobody takes insurance to cover the risk of title litigation. In Japan, it is highly likely that the full-fledged population decline, low birth rate and aging population will lower the profitability of land. In that case, a titling system with low strength is likely to be the best for society as indicated in the analysis above.

Keywords Land plots with unknown owners · Low birth rate and longevity · Registration system · Recording system · Titling system's strength

M. Nakagawa (✉)
Nihon University, Tokyo, Japan
e-mail: nakagawa.masayuki@nihon-u.ac.jp

3.1   Introduction

The problem of land with unknown ownership has become a hot topic. The 'Basic Policies for Economic and Fiscal Management and Reform 2017' state, 'Lands without readily-identifiable owners have been addressed as a common agenda when implementing public works projects and consolidating agricultural and forest lands. With the goal of proper utilization and management of these lands according to the conditions of individual areas, the relevant Ministries and Agencies will together examine the clarifying the requirements for agreement on managing common properties, establish a new system that enables a wide range of public use in response to local needs through the involvement of public bodies, and create measures to eliminate lands of which inheritance registration has not been made for a long term. Moreover, they will aim at submitting a necessary bill to the next ordinary session of the Diet. Furthermore, taking into consideration an increase in lands without readily-identifiable owners due to a decline in population, examination on mid- and long-term issues including the registration system and the current state of land ownership will be swiftly initiated at relevant councils, etc., and results of the examination shall be reported to the Council on Economic and Fiscal Policy... In addition, while expanding the range for utilizing the certification system for statutory succession information, it will further proceed with efforts to, collect, organize, and utilize information on owners from both institutional and organizational perspectives'.

The problem of land with unknown ownership is becoming increasingly evident with Japan's declining population, low birth rate and ageing population. A comprehensive approach is required to work out how to adapt the real estate system to the underlying issue of the population problem. However, this paper will confine its argument to more directly relevant matters. Taking 'Land for which the owner cannot immediately be identified from an owners' ledger such as the real estate register, or for which the owner is uncontactable even if the owner is identified' to mean land with unknown ownership, the titling system may be considered to have created an environment or been behind this problem of land with unknown ownership. Therefore, this paper examines the need for the titling system using perspectives from economics, considers what sorts of titling system work for which types of society and looks at ways to deal with the problem of land with unknown ownership.

This paper is set out as follows. Part 2 explains two types of titling systems. Part 3 discusses the distinctive features of Japan's titling system. Part 4 discusses the impact of the choice of titling system on economic welfare. Part 5 provides a summary.

3.2   Two Types of Real Estate Titling Systems

First, it is important to consider why real estate ownership needs to be protected. According to Besley (1995), there are three reasons why the state protects real estate ownership. First is the freedom from expropriation and being plundered by others. In

societies where such things occur, no one will invest in land if the fruits of their investments could be seized by others. The second reason is the ability to use real estate as collateral for borrowing. This not only fosters direct investment in real estate but overall investment.

The third reason is the benefit to society as a whole from transactions if it is transferred to a party who finds higher value through land transactions.

The protection of real estate ownership in this way is indispensable from the perspective of stimulating economic activity and improving the quality of life. To protect this ownership, there needs to be a scheme that clarifies the information concerning who owns what. Therefore, advanced societies all have some sort of titling system.

A series of previous researches such as Miceli et al. (1998, 2000) categorize the titling systems used in many advanced countries as either registration systems or recording systems and economic evaluations have been conducted for the two systems. The following provides a simple explanation of the two titling systems, followed by comments on features of Japan's titling system.

Under the registration system, the ownership transfer is not valid unless registered, and the country's registrar conducts a substantial inspection when registration occurs. Subsequently, the ownership is not transferred even if there is litigation from the true owner. Instead, the registration fee is used to fund financial resources and such financial resources are used as compensation to the true owner. In other words, this can be perceived as the government operating an insurance scheme. Although not stated in research such as Miceli et al. (1998, 2000), this is a requirement for taking effect, and it appears to be the method used in the publicly recognized German titling system for example.

On the other hand, the recording system is a scheme widely adopted in the US. When transferring ownership, the real estate transfer certificate (deed) is registered with the registry office. A deed is compiled and stored for each person at the registry. No substantive inspection is conducted by the registry office. To know who the true owner of real estate is and whether or not the recent sales contract has been entered into by the true owner requires after-the-fact confirmation. That is, even if going to the registry office, it is difficult to know who the true owner is unless the person is an expert. Therefore, insurance is available through a title insurance company for a person buying real estate to protect against any form of loss incurred by a real estate buyer due to reasons other than fact that become evident through inspection and examination concerning whether or not a purchase of real estate is based on true ownership. That is, under this scheme, where the true owner is registered, any loss incurred by a person who thinks he has acquired ownership based on registration and subsequently confirms that the registered title deed holder is not the owner shall be covered by insurance.

In fact, although there are many more titling systems, Miceli et al. (1998, 2000) largely categorized them into two schemes and conducted economics analysis. The difference between the two schemes is whether or not the title is publicly recognized. Japan's titling scheme does not recognize the title, so it can be considered close to a recording system.

3.3 Features of Japan's Titling

3.3.1 A Recording System for the Titling System

In Japan, titling is a mere third-party perfection requirement. In addition, since the principle of protection for public registration does not apply to real estate, even if the title indicates A to be the owner, if A is not the true owner, there is no protection if B acquires ownership from A. Therefore, it is inevitable that the recording system leads to 'transfer of ownership to the true ownership through ex-post-facto litigation'. However, unlike the situation in the US, the information that is listed on the title in Japan is thought to reflect 'some kind of' true ownership relationship.

Next, we consider these types of cases. For example, this includes cases such as 'A forges documents to pretend that he is the sole owner even though the real estate was acquired through inheritance not only by A, but also A' as joint heirs' and 'A pretends to be the owner of real estate through forged sales contracts, etc'.

However, to register the title of this real estate requires the certification of the registered seal of A' and the seller of such real estate, so in practice it is very difficult to forge. Therefore, the information listed on the title is very likely to indicate the true ownership relationship with the real estate at some point in time.

Even though it is difficult to forge this type of ownership transfer, the case of positive prescription can be considered where the information on the title is not genuine. Although A certainly had ownership, A' has been a long-term occupant and positive prescription is established. In this case, if B has been registered as the owner even if this was done by B transacting with A, who does not have ownership, it would be treated in a similar way as a double sale in terms of legal precedent with the ownership being transferred from A to A' and the ownership being transferred from A to B. This means true owner A' would not be able to oppose B. That is, in Japan, even when true ownership is not reflected, the registered details are what are protected.

It is often the case, however, that this information does not reflect the current state of the owner relationship and the real estate is still registered in the name of the past owner. That is, the information listed on the title is 'very unlikely to be a lie', 'the person in the title is protected (even in the case of transaction where there is reliance on the title even though it does not reflect the truth)' and so the situation is close in operation to that of a registration system. On the other hand, unlike a registration system that is always updated with true information as it is a requirement for ownership transfer, a feature of this system is that it may not 'convey the current truth'.

3.3.2 The Cost of Not Reflecting the Current Owner Relationship

So, what types of measures can be adopted where the title does not convey the current owner information? While assuming that the registered owner is most likely

dead, we consider the case of there being an occupant who has resided at the property for a reasonable length of time. In that case, we assume the current owner has exercised positive prescription over the land and to confirm this, adopt procedures that select the absentee administrator of the owner who is assumed to be dead. The acquirer of positive prescription institutes an ownership confirmation lawsuit against such absentee administrator and confirms the positive prescription. Then a person who requires such land conducts a land transaction with the acquirer of positive prescription as the counterparty.

However, what is the possible response if there is no occupant and the registered owner is thought to have died? In such case, the aim could be to search for the heir of the registered title deed holder. Negotiations concerning the sale of the real estate, etc. are conducted with the heir identified through search activities. However, there are no doubt cases where the heir is not identified regardless of a search.

In the case of public works, procedures referred to as an unknown owner award can be taken. This refers to a request that can be made to the Expropriation Commission for businesses that are highly public in nature with certified projects, if the owner remains unknown even after instituting measure such as investigating the relatives and documents that indicate the whereabouts of the registered owner and asking long-term residents in the vicinity of such real estate.

However, what sorts of procedures are available in the case of the private sector such as companies and households? In such cases, it is possible to assign an absentee administrator to the unknown heir. A, who received the ownership of such land from the identified heir, shall co-own such land with the unknown heir who is represented in such interest through the absentee administrator. In addition, A can acquire the ownership of the land by filing a lawsuit, claiming partition of properties in co-ownership and using the method of full-scale price compensation. However, this series of processes requires approval by the courts. In addition, the absentee administrator may also sell the co-ownership interest to A with the permission of the family court.

Therefore, when the owner is unknown, considerable costs can be incurred in acquiring the ownership of such land and being assigned rights.

While it would be preferable to avoid such costs, is it possible to transfer ownership without instituting such measures?

In such case, the buyer is most likely unwilling to take such risks. In addition, when transacting through a real estate agent, the real estate agent has a duty to investigate the important matters to be explained with strict investigation of the ownership and reporting thereof. In the case of transactions involving finance, the financial institution itself or the judicial scrivener will undertake a title search, and most likely not provide finance for land for which the whereabouts of the owner is unknown.

That is, although Japan has largely adopted a scheme that is categorized as a recording system, but when the title of the land is not 100% clear, it is not fair to state that transactions are being conducted on the basis that risk is being hedged through insurance unlike the case of the US.

3.4 Economic Evaluation of the Choice of Titling System

3.4.1 The Theoretical Framework

The following discusses what type of impact the real estate titling system has on the welfare level of society as a whole. Land price is used as an indicator of the welfare level.

Miceli et al. (2011) compare the two tilting systems, i.e., the registration system and the recording system. Since the recording system does not publicly recognize a title, as noted above, the whereabouts of ownership is determined ex-post-facto through litigation and in that case the private sector title insurance plays a large role in preparing for the losses by that actual owner. On the other hand, the registration system recognizes the title, so even if there is litigation by the true owner, the ownership is not transferred, and compensation is paid from a fund that is financed by fees assessed on owners who register their properties. Miceli et al. (2011) assert that, in theory, land with low probability of litigation has high land value under the recording system, whereas a similar effect is found for land with a high probability of litigation under the registration system.

However, as seen so far above, although it can be basically classified as a recording system, the reliability of the registered information is high in the Japanese titling scheme that has no recognition, and litigation based on this is unlikely to occur at the high rate of frequency seen in the US. That is, there is not just one recording system with many variations likely. Since the model used in Miceli et al. (2011) by itself cannot give such a clear depiction, the concept of a titling system's strength (s) is introduced in the following to provide a theoretical examination of the issues confronting the Japanese titling system. The titling system's strength refers to a variable that represents the degree of the evidence required when registering and the strength of the registrar's examination. If the titling system's strength s increases, the cost of transaction due to ownership transfer through real estate sales or inheritance $T(s)$ increases with $T'(s) > 0$, whereas the risk of litigation claims surrounding such real estate declines $\theta(s)$ ($\theta'(s) < 0$. $\theta''(s) > 0$). This variable is presented as follows.

V_i: market price of real estate i
$R_i(I)$: present value of stream of returns from real estate i, and I is an increasing function of investment amount
$T(s)$: the expected present value for transaction costs including future transactions
π_i: the risk premium concerning the title of real estate i.
P_i: the land price of real estate i
I: the amount of investment in land

In this case, the market price of real estate i is described as follows.

$$V_i = R_i(I) - T(s) - \pi_i \tag{3.1}$$

(3.1) can also be written as follows.

$$V_i = P_i + I \tag{3.2}$$

In addition, the land price of real estate i can be written as follows.

$$P_i = R_i(I) - I - T(s) - \pi_i \tag{3.3}$$

For the recording system, if the current owner of the real estate is faced with a litigation claim from the true owner, he will lose ownership and be paid compensation of the investment amount I, so his loss will be $R_i(I) - T(s) - I$. Taking $\theta(s)$ to be the probability that there will be a claim for litigation concerning ownership from the true owner, the risk premium is

$$\pi_i = \theta(s)(R_i(I) - T(s) - I) \tag{3.4}$$

Therefore, the following holds true.

$$V_i = (1 - \theta(s))(R_i(I) - T(s)) + \theta(s)I \tag{3.5}$$

Now, taking the differential of (3.5) by the strength of the titling system obtains the following.

$$\frac{\partial V_i}{\partial s} = -\theta'(s)(R_i(I) - T(s)) - (1 - \theta(s))T'(s) + \theta'(s)I \tag{3.6}$$

The first term on the right hand side of Eq. (3.6) indicates benefits from increasing the strength of the titling system and lowering the litigation risk. The second term indicates the cost associated with increasing the strength and the increasing transactions costs into the future. The third term indicates the costs from a lower amount of compensation for the investment portion with lower risk of litigation. When Eq. (3.6) becomes 0, the title strength s is one where the system maximizes the asset price of the land.

3.4.2   Simulation Using Numerical Examples

The best s is forecast to differ depending on land i, but here we apply different values concerning the return on investment $R_i(I)$ to examine what sort of impact is given to the strength of the best titling system.

The following provides a qualitative discussion based on numerical examples. We constructed numerical examples based on the following assumptions.
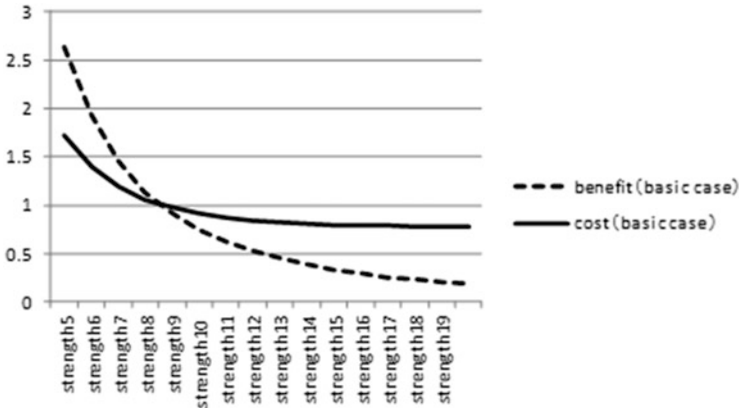
Chart 2.1 Marginal benefit and marginal cost for the base case ($b = 2$)
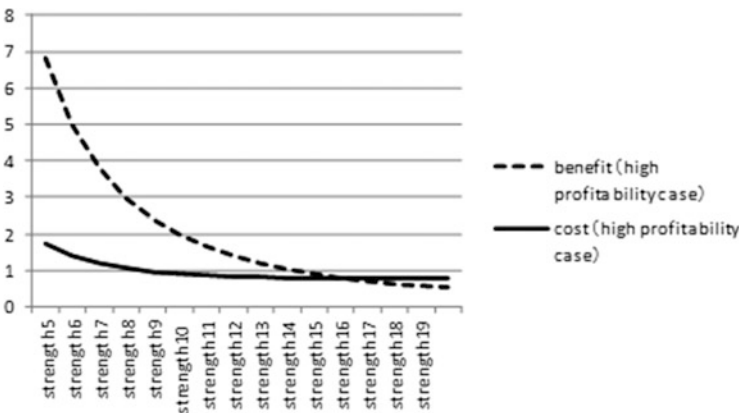
Chart 2.2 Marginal benefit and marginal cost for the high profitability case ($b = 5$)

- For simplicity, the titling system's strength s is set to be the same value as the transaction cost T. Since there is a certain level of transaction cost even without a titling system, this is changed from 5 to 20.
- We take. Where a is the efficiency of the titling system, i.e., a parameter that indicates the impact that the titling system's strength has on the probability of litigation (Charts 2.1, 2.2, 2.3 report the case where $a = 0.1$).
- We take $R(I) = bI$. Where, b is a parameter that indicates the profitability of investment (the base case shown in Chart 2.1 is where $b = 2$, the high profitability case in Chart 2.2 is where $b = 5$ and the low profitability case in Chart 2.3 is where $b = 1.1$).

As shown in Charts 2.1, 2.2, 2.3, the strength of the best titling system increases with the increase in profitability of investment in land.
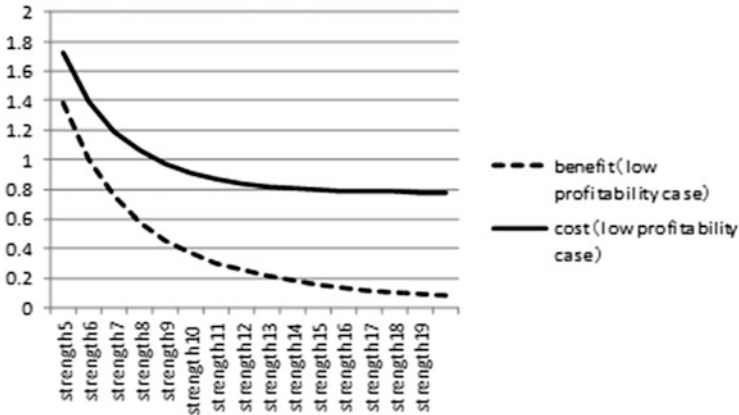
Chart 2.3 Marginal benefit and marginal cost for the low profitability case

In the case of land with high profitability, even if an increase is forecast for the future transactions costs, this indicates that it is better to lower the level of litigation risk. On the other hand, in the case of low profitability of land shown in Chart 2.3, regardless of which strength is selected, the costs exceed the benefits and there is no need to protect ownership through the titling system.

3.5 Conclusion

As noted above, in terms of broad categorization Japan's titling system is categorized as a recording system. However, since the details of registered information are confirmed through various registration procedures, the system also has aspects that resemble a registration system, yet there has been a problem of registered information not being updated. In terms of the analytical framework presented in sect. 3.4, this can be interpreted as having selected the titling system's strength that considerably lowers the level of litigation risk. In that case, transaction costs become very high. This could be the cause of the excessively small current level of Japanese real estate transactions.

Furthermore, the result of selecting the recording system in Japan, which is a system with a very high strength, could explain why nobody takes insurance to cover the risk of title litigation. In the case of the registration system, the state takes insurance. The business of title insurance companies occurred spontaneously for the recording systems. However, recording systems with high strength have very low litigation risk, so there are no opportunities for such a business to arise.

In Japan, it is highly likely that the full-fledged population decline, low birth rate and ageing population will lower the profitability of land. In that case, a titling system with low strength is likely to be the best for society as indicated in the analysis above.

However, steady progress in measures such as compact city initiatives will likely cause the profitability of land to become increasingly dispersed. That is, the gap between land with very high profitability and land with low profitability will widen. In this case, the strength of the titling system that should be selected will vary greatly according to the land. However, it is obviously difficult to have different strengths of titling system according to the land. That is, even in this case, the titling system with low strength that should be adopted for Japan as a whole is likely to be adopted, and this could lead to users selecting methods to hedge risks such as subscribing to insurance.

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Chapter 4
Land Plots with Unknown Owners: Causes and Legal Measures—The Necessity for a Thorough Reduction of Transaction Costs

Hideo Fukui

Abstract The increase of land plots with unknown owners, namely, land plots whose owner's name and address are not easily identifiable through repeated inheritance, etc., has emerged as a prominent social issue. The major reason for this phenomenon is the Civil Code that unconditionally allows the sharing of real estate by an unlimited number of co-owners, for one thing, and the registration system of real estate that does not require the true owner to register and thus does not show the real rights of real estate, for another. To reduce the increase of land plots with unknown owners as a proactive measure and to utilize them as a reactive measure, it is necessary to establish the one-owner principle with a ban of the sharing of real estate even through inheritance, to abolish fixed asset tax on buildings and houses, to require the new owner of real estate to register the right upon the transfer of ownership and for the registration office to make it public, to amend the Land Expropriation Act to facilitate the purchase of the land plots for public purpose without owner identification, to create an institutional arrangement that allows the will of the owner to be fictionally replaced, and to amend the Civil Code to allow the disposal of shared real estate by the majority of the co-owners.

Keywords Real estate · Unknown owners · Registration · Inheritance · Transaction cost · Civil Code

4.1 Why Is There Land with Unknown Ownership?

There has been a considerable increase in the number of problematic cases caused by a landowner being unknown, or unreachable if known, as in the case of land acquisition for public use. This has led to discussion at various levels concerning

H. Fukui (✉)
National Graduate Institute for Policy Studies, Tokyo, Japan
e-mail: fukui@grips.ac.jp

the causes and solutions.[1] In particular, there are cases with successive inheritance of land that should have resulted in co-ownership among multiple heirs, yet because of the complete lack of update in registration, the land remains registered in the name of the Meiji era owner. An enormous amount of time and effort has to be expended to search for and acquire ownership when land is required for public purposes.

In many cases where the usage value does not warrant an enormous burden, such as the situation wherein there is acquisition or intended use by the private sector, the land remains underutilized for a long period without a transfer of ownership or an establishment of the usage rights. The causes of such cases are investigated below.

4.1.1 The State of Shared Ownership That Tends to Arise Through the Ownership and Inheritance Provisions in the Civil Code

Successive inheritance and transition without discussion about the split of inherited property lead to land and buildings remaining in a state of co-ownership in perpetuity. Subsequently, mutual discussion and arrangements for management of the land and buildings become practically impossible. Unless there is a transition to special procedures such as the determination proceeding for unknown ownership under the Expropriation Act, the relationship of rights and the physical form of land use will be effectively frozen regardless of the reasonable intent of the relevant parties or the most effective utilization of the land.

The fundamental cause is considered to be the ownership and inheritance provisions under the Civil Code that enable a state of shared ownership for land and buildings for which it is difficult to reconcile the rights.

The "state of shared ownership" is an exception to the Civil Code's official principle of sole ownership, so the Civil Code views it as a temporary situation that requires resolution as quickly as possible with restoration to sole ownership. Therefore, "the freedom to split common property and transfer the owner's interests is granted to each co-owner."[2] However, a transfer requires an agreement of intent of relevant parties. In a typical case of a problem of land with unknown ownership, the person who should express the intent is often unknown, and the transfer of interest does not function. In addition, this does not work when splitting common property in the case of a building because a building will not qualify for sole ownership unless

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[1]National Land Planning Association "Working Group on the Problem of Land with Unknown Ownership (Chairman, Hiroya Masuda)" http://www.kok.or. jp/project/fumei.html, Ministry of Land, Infrastructure, Transport, and Tourism, the National Land Council, http://www.mlit.go. jp/policy/shingikai/s101_kokudo01.html, Japan Association of Real Estate Sciences, The Association of Urban Housing Sciences, The Japan Association for Property Assessment Policy "Working Group on Land with Unknown Ownership (Chairman, Masaaki Iwasaki)," etc.

[2]Suzuki (2007) page 41.

special circumstances exist, as in the case wherein the building comprises individual units that can be split. Even in the case of land, various matters are prescribed, including access regulations, size of site regulations, overshadowing regulations, building coverage ratio, and floor area ratio regulations according to specific public regulations such as urban planning and building regulations. Therefore, there are many circumstances where it is actually difficult to protect the asset value through sole ownership by splitting it. Hence, this method cannot always be said to work. Furthermore, where multiple co-owners already exist, it is often the case that the interests belonging to the identified co-owners are very small, and the object of sole ownership has no significance.

The co-ownership of land and buildings is, in principle, possible under the Civil Code, but the consent of other co-owners is required if any of the co-owners wishes to make an alteration to such properties (Article 251 of the Civil Code). This "alteration" includes acts of disposal such as sales, so the property cannot be sold without the consent of all co-owners.[3]

Furthermore, under the current inheritance law, land and buildings will be co-owned in accordance with the legally inherited portions unless a settlement is made about inheritance split at the time of inheritance. However, inheritance specialists strongly recommend avoiding co-ownership of inherited land and buildings. This is because it is difficult to reconcile the rights, even those of relatives, of co-ownership of land and buildings as the settlement has to abide by the rules in the rights of ownership of the Civil Code. This reduces the profits that can be generated from the land and is highly likely to impede the effective utilization of the land.

Even in the case of inheritance, the inherited land and building will automatically be subject to discussion about inheritance split unless there is a will. Disputes between relatives concerning such inheritance are common. Even if there is a desire on the part of a child who has been a long-term resident living with the person who dies, to inherit a residence, unless the discussion about inheritance split is successfully completed, such child must either purchase the interests of other heirs or sell the residence and distribute the proceeds according to the proportion of legal inheritance when there are other heirs. Agreement is not always possible. In such cases, the current inheritance law is contrary to the intent of the Civil Code. If anything, the principle is the co-ownership of land and buildings through the legal division of inheritance; the structure only allows for the approval of a sole owner in the exceptional case that agreement is achieved.

However, where there has been successive inheritance and extreme fragmentation of the rights for land and buildings, enormous transaction costs can be incurred in reconciling the rights to achieve a unanimous decision of all heirs to sell; it is

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[3]By contrast, in accordance with Article 252 of the Civil Code, management actions such as certain leases may be determined by co-owners holding a majority of the value of the shares, but it is difficult to arrange the discussion itself when there has been successive inheritance and the co-owners holding the majority are hard to identify.

effectively impossible. Therefore, the appearance of an intricate state of shared ownership ultimately results in the unconditional release of such real estate based on the ownership law under the Civil Code and the inheritance law that unconditionally approves inheritance with various fragmented co-ownership rights themselves being considered the source of the problem.

4.1.2 Real Estate Registration has Little Benefit Despite the High Cost

Currently, Japanese real estate registration is merely a perfection requirement (Article 177 of the Civil Code), and it is irrelevant for the efficacy of ownership transfer. There is also no obligation for registration. Therefore, registration cannot be said to show the true relationship of rights, yet there is also no other system providing public notice of the true owner. The title deed holder of the land and building in the registry often does not reflect the true owner.

In addition, registration procedures are not necessarily easy for an ordinary person and require a certain degree of specialist knowledge as well as time. Furthermore, real estate registration tax due to titling is, in principle, 2% of the price recorded on the normal fixed asset tax register such as the ownership transfer title. Such amount greatly exceeds the substantive intent of the titling fee. When this cost and the fee payable to specialists (e.g., judicial scriveners) are calculated, in cases where each individual ownership transfer does not require registration, a middle omission registration (i.e., registration of only the initial and final owners and omission of the rest), which saves on the inconvenience and the cost, is widely used to avoid the high costs that are levied regardless of the low benefits of titling.[4]

In conjunction with this, apart from when the land has an exceptionally high asset value, the title has little benefit and incurs a large cost in many cases, so the individual registration of ownership transfers is unlikely. The continuation of such practice has exacerbated the state of owners being unknown, making effective use more difficult. Land such as urban residential land with high usage value is being identified, even at a cost, and is fluidized. However, there is little benefit in having a title for areas on the outskirts of cities and rural and/or mountainous districts, resulting in a tendency for the title on such properties not to reflect the true owner. The relative merit of effective utilization gradually ceases to be worth the cost.

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[4]Fukui and Yoshida (2008) pages 8 to 25.

4.1.3   The High Cost of Land Fixed Assets Tax Means It Is Not Worth the Usage Value

The fixed assets tax on land is, in principle, levied every year at a rate of 1.4% of the market value (Article 350, paragraph (1) of the Local Tax Act). Detailed provisions of the basis for the valuation of fixed assets and procedures, etc., are in Article 388 and the following articles of the Local Tax Act. However, apart from disputes on the valuation of fixed assets when land prices have fallen, with tax based on appraisal values higher than actual market values, it is observed that there have been high valuations on land with little marketability in regional areas where it has been hard to estimate a real transaction price because of a virtual lack of actual transactions. The fixed assets tax levied on land ownership functions as the payment for the benefits of public service and public welfare facilities that belong to the land, including roads, water, and sewer services as well as public parks. In this regard, the fixed assets tax is intended to cover the cost burden for usage fees that are difficult to collect, for so-called public goods (i.e., goods for which simultaneous consumption is possible and the exclusion of any given user is difficult) or for facilities that provide special benefits to land owners owing to the location of the land, even if usage fees could be collected. That is, this entails a request to cover the costs of facilities with positive externalities (benefits to persons other than the relevant transaction parties).

Landholding tax inherently reduces profit and the price of land. However, as long as the tax amount is commensurate with the benefits of services received in this manner, it does not inhibit the effective utilization of land and secures financial resources. As long as such resources are invested appropriately, it also promotes the effective utilization of land. However, were there a high tax burden that was not commensurate with the utilization value, as in the case wherein tax is based on the appraisal value that is constantly higher than the actual price, the price of land would fall in proportion to such a tax burden. If the tax burden exceeds the expected profit, owning land would become disadvantageous and a rational choice would be to dispose of such land. However, few people are likely to keep or take such land not to mention that the national and local governments will not accept the donation of such land. The incentives for land use gradually dwindle because of distorted taxes that do not match the value of the asset, and there is a tendency for ownership to become unknown through successive inheritance.

4.1.4 This Fixed Assets Tax on Buildings Does Not Function as the Beneficiary's Burden in Relation to Public Service and Public Welfare Facilities

This is because the externalities of these facilities are only reflected in the value of the land and are irrelevant for building values.[5] In addition, since the tax on buildings always increases the burden on the effective utilization of land by way of construction activities, it functions as a tax system that inhibits investment and is always negative for the effective utilization of land.

Furthermore, by taxing at the "market value" of the building under the Japanese valuation of fixed assets standard, buildings with high earthquake resistance properties that are solid, safe, and better for the environment pay a higher amount of tax than other buildings even if the floor space is the same. In other words, the system provides preferential treatment for buildings that are dangerous and weak and that have poor environmental performance and habitability.

In this regard, the fixed assets tax on buildings is always an impediment to the utilization of land. Since this is an impediment to investment in quality safe buildings in particular, it promotes land becoming vacant and contributes to the situation of unknown ownership.

4.1.5 Distortion in Inheritance Tax Assessment

Depreciation of a land lot with a building and depreciation of rental houses in the inheritance tax assessment distort the neutrality of land use. Moreover, it is an obstruction to the effective utilization of land. The recently discussed vacant house problem, in particular, is the problem of keeping, not scrapping, the buildings which are not only degraded and unusable but of negative externalities such as the danger to the neighboring areas with fire and collapse, deterioration of the aerial environment with insects, dust, exuberant plants, and uncomfortable landscape. However, one of the main causes of obstruction to effective utilization is the favorable treatment under the tax system for the retention of buildings in the assessment of inheritance tax. Having a vacant land lot is disadvantageous while waiting for inheritance, and

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[5]Fukui (1999) argues that the convenience of location and environmental factors should all be considered for the land valuation only in relation to loss compensation for land expropriation. This is because they do not belong to the building and should not be assumed to have an impact on the building for the reason that other factors, such as the value of the view for a compartmentalized ownership building, should be considered as the rights of the interests of all co-owners of the land and therefore not part of the evaluation of the building. Factors other than those that have physical value, such as the materials, equipment, and structure of the building, assume the possibility that the house can be moved as is as well as dismantled and relocated.

retaining even a poor quality building without demolishing it becomes the logical choice for landowners.

In any event, the favorable treatment of a land lot with a building regardless of its quality under the inheritance tax assessment means even the land that should have renewed land use tends to be left with buildings of inefficiency. Moreover, because the motive of land use is to deal with inheritance tax, such treatment promotes the state of unknown ownership occurring through inheritance. To begin with, inconsistency emerges since the fixed assets tax on buildings is negative for investment in high-quality buildings while inheritance tax provides favorable treatment in relation to the retention of low quality buildings.

4.2 Land with Unknown Ownership as a Problem of Transaction Costs: The High Cost of Reconciling Rights Is an Obstacle to Land Use

As noted above, various factors contribute to unknown ownership, including several artificial and systemic factors. These factors contribute to the decline in incentive for the owner himself or herself to use the land and make it difficult to find an interested buyer. Furthermore, once there is shared ownership due to inheritance, for example, it exacerbates the difficulties of using the land in what becomes a negative spiral. Once the number of co-owners exceeds a certain threshold, the cost of reconciling the rights becomes extremely large, resulting in the cessation of future transactions and land use. Consequently, the names and whereabouts of many co-owners become increasingly unknown. Therefore, the certainty of the current method of use for such land is virtually limited to the cases in which determination proceeding is applied without identifying the owner's name or address for business with broad expropriation rights such as businesses that just happen to be qualified for expropriation as well as land readjustment projects under the Expropriation Act and urban area redevelopment projects.

In and of itself, if the ownership right is clearly described and if the transfer is freely made and no cost is incurred on such transfer, such land would always be used effectively regardless of the owner. This is Coase's theorem.[6]

The assumptions of Coase's theorem do not necessarily always correspond to the real world, but determining the rules for methods concerning ownership that come close to such assumptions would function as a method to promote the constant effective utilization of land.

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[6]Fukui (2007), pages 72 to 73, discusses the rights concerning running water from rivers and the rights to an injunction concerning environment pollution in pages 235 to 245 adding analysis from the perspectives of Coase's theorem and transaction cost, respectively. Fukui (2001) discusses land use regulation and public legal regulation from the perspective of Coase's theorem.

The important implications from Coase's theorem are as follows. First, the law should prescribe the details of rights clearly and simply. Second, the law should prescribe procedures such as the administration of justice and administration to minimize the transaction costs, including those for the adjustment of rights, as much as possible. Third, the law should allocate rights, such as the initial ownership rights, to the side that has the lowest sum total of ex-post-facto transaction costs so that the transfer of rights can proceed as smoothly as possible through negotiation with the ex-post-fact relevant parties.[7]

From this perspective, even if co-ownership is positioned as "temporary," the following facts are contrary to the theorem's first implication: first, that co-ownership is, in actuality, allowed and the ownership law in the Civil Code is a structure with readily growing complications that inevitably require large adjustment of rights for the procedures and management of co-owned land and second, that the inheritance law does not have a special level of interest regarding real estate co-ownership and easily allows co-ownership

As noted later, the determination proceedings for unknown ownership in the case of land expropriation are a major burden for expropriators, whereas expropriation procedures cannot be dealt with easily or with speed.

There could be certain possible measures for private sector businesses such as those via the system of administration of absentee property (from Article 25 of the Civil Code) and the administration system for inherited property (from Article 951 of the Civil Code), but there are constraints on the act of disposal in such cases. In addition, where it is not known if the heir is alive or such person's address is unknown, the latter does not apply, and it is virtually impossible for a private sector business to purchase land with unknown ownership.

In this regard, from the perspective of the smooth transfer of rights, there are major constraints on the decision-making by the relevant party or the alternative decision-making by the relevant party to undertake an act of disposal as a right under existing law, which is also contrary to the second implication above. For the allotment of the initial rights, the scheme tends to assume multiple co-owners and not a sole owner, which is also contrary to the third implication of Coase's theorem above.

It is no exaggeration to state that the problem of land with unknown ownership is a product of a legal system that tends to artificially create high cost for reconciling rights. How to reduce such transaction costs as much as possible should be taken to task. In this case, there needs to be a transition to processing methods assuming unknown ownerships. However, if the legal system that tends to create neglected unknown ownership remains as is and the ex-post-facto transactions costs are kept intentionally high, the effort required for such process is quite unreasonable.

Therefore, in addition to measures for the effective utilization of land with unknown ownership, it is imperative to have preventive measures so that it becomes difficult for land with unknown ownership to exist in the first place.

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[7]Fukui (2007) pages 238 to 239.

4.3 Fixed Assets Tax on Land and Buildings, Land Capital Gains Tax, and Land Liquidity

Further detailed consideration is made concerning the aforementioned problem of tax on land and buildings.

4.3.1 Land Tax

The fixed assets tax on co-owned land is a joint obligation of all the owners (Article 10-2 of the Local Tax Act). In practice, it is often the case that the local government bodies in regional areas issue the request to an appropriately prescribed representative. Fixed assets tax cannot be avoided unless the evaluation is below a certain tax exemption threshold, even if the land has no actual usage value and even when it is difficult to reconcile the rights. Conversely, the land transfer tax is not levied even if there is a transfer as long as there is no profit on the transfer.

For fixed assets tax, the appropriate tax rate that applies to the market value, or, in other words, anticipated usage value in the market, means that the tax burden on land with low usage value should be small, yet in actuality, a high amount of tax is often levied.[8]

Were fixed assets tax levied in excess of the profit value of the land, the land itself would become a negative asset. If the tax is higher than the profit from the effective utilization of land, it is better not to own the land. If it is not permitted to renounce ownership of this type of land during the owner's lifetime, it becomes increasingly likely that an heir will renounce the inheritance at the time of inheritance.

In addition, even if the fixed assets tax is lower than the profit value of the land, the benefit of the land will similarly disappear if tax accounts for a large proportion of the profit. The higher the level of tax relative to the profit value, the lower the market price of the land.

Furthermore, when agreement of all co-owners is, in practical terms, impossible, the land cannot be disposed of as the basis of creating profit from the land is lacking. The value of the land as an asset will head toward zero or negative in terms of capitalized value when management fees such as those for cleaning and weeding are considered. If so, the evaluation of "market value" based on the physical form of the land alone is an interpretation that restores the original intent of local tax and is very unlikely to be suitable. There is scope to interpret that the levying of fixed assets tax and inheritance tax, taking into account the profit value that also accounts for the difficulties of rights adjustment, should be how the inherent market value is determined. Landholding tax in excess of the value fosters land immobilization and the

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[8]According to the teachings of real estate appraisers, Haruki Hirasawa and Hiromi Horikawa.

renunciation of inheritance, thereby accelerating the ruination of our national territory.

When there is a period of rising land prices, capital gains tax has the effect of freezing land transactions (when there are expectations that the price of land will rise, it is beneficial to postpone sales so that transactions are put on hold on the basis that profit will accrue by deferring the payment of the capital gains tax on land). The levying of a land capital gains tax (a tax levied at a high tax rate on the sale price minus the acquisition price, further deducting the added value formation for the owner, and the annual landholding tax, levied on the market price minus the acquisition price multiplied by the interest rate. The profit from the deferred payment of land transfer tax is offset, so it promotes the effective use and liquidation of land) is a preferential tax method to promote the effective utilization of land that removes the adverse effect of land speculation and greatly increases the liquidity of land.[9] However, even in this case, there must be a purchaser, and the market value after deducting the cost for rights adjustment needs to be positive to enable selling. Selling and effective utilization of land can be difficult depending on the cost to adjust rights.

This is to say nothing of the case where a fixed assets tax is levied, shrinking the profit to the extent that the market value accounting for the cost of reconciling the rights to make use possible falls further with the likelihood of incurring an unrealized loss when the effective present price is below the acquisition price. Apart from the large possibility of an increase in the abandonment of inherited land with consolidation of ineffective land use and the obstruction to effective utilization, this would not appropriately resolve the co-ownership issue at the time of inheritance and also promote the emergence of land with unknown ownership and land that remains unregistered.

4.3.2   Building Tax

The optimum tax rate for holding tax in relation to buildings and fixed assets tax in particular should in essence be zero. Tax on buildings is always a hindrance to the effective utilization of land by obstructing building investment, so the tax itself is harmful. However, a very large portion of fixed asset tax applies to the buildings compared to the land.[10]

Moreover, in evaluations of buildings, the ones that use safe methods of construction with resistance to earthquakes and high environmental performance are appraised with high amounts, giving favorable treatment, so to speak, to low

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[9]Fukui (1997), Iwata (1977), Iwata et al. (1992) pages 183 to 208.

[10]According to materials from the Ministry of Internal Affairs and Communications, revenue from land fixed assets tax accounted for 16.4% (3374 billion yen) and revenue from fixed assets tax on buildings accounted for 17.7% (35,684 billion yen) of total revenues from municipalities tax in FY2013.

efficient buildings. It is no exaggeration to state that the fixed assets tax on buildings is a tax system that encourages cheap structures contrary to the promotion of the effective utilization of land.[11]

However, for buildings with negative externalities such as vacant premises that have a negative impact on the nearby environment and buildings with inadequate earthquake resistance and low energy efficiency, levying building holding tax in line with the level of such negative externalities can be considered reasonable in respect of charges under Pigouvian tax. Nevertheless, for buildings without such elements, the levying of building holding tax is increasingly disadvantageous for land use and obstructs investment and ownership.

Thus, it fosters the emergence of land with unknown ownership and is an obstacle to the effective utilization of land.

Furthermore, the evaluation of fixed assets tax on buildings in Japan is conducted using a unique method referred to as the reconstruction cost method. This is a complex and bizarre method for determining the appraisal value that assumes reconstruction using the same method of construction and materials as when the building was new to calculate the construction costs, even if many years have passed since such buildings were built, with accrued depreciation from when the building was built. The method and the materials of construction are essentially different from the method of construction and the materials for the building that would be the most effective utilization at the time of evaluation given the progress that has been made in construction technologies and new preferred methods of construction and materials. However, since no one who would actually build using old materials and methods of construction is likely to be around, the cost of construction using difficult to procure materials and old methods will always be much more expensive than the cost of a new build. As long as evaluations for the reconstruction cost method are based on this strange manner of thinking, the starting point for the appraisal value will be expensive compared to the cost of a new construction and to the acquisition price. Consequently, there is a tendency for the evaluation to be higher than the actual market value of the building corresponding to the years of deterioration. Owing to this gap, the acquisition of old buildings is disadvantageous in terms of tax and reduces the evaluation of the building in the market. It is also an obstacle to the liquidity of existing homes. In the case of inadequate marketability, vacant premises tend to emerge, and negative externalities on buildings tend to appear even for buildings with actual residents. When there is inheritance of such buildings, the rights become increasingly intricate and the problem of land with unknown ownership is exacerbated. The problem of vacant premises and the problem of land with unknown ownership are therefore sustained problems.

In addition to being disadvantageous for building investment and the effective utilization of land, the fixed assets tax on buildings and the over-valuation of buildings through the reconstruction cost method substantially increase the tax

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[11]Fukui (2016).

cost, which not only creates unnecessary administrative costs but also obstructs investment in and utilization of buildings.

Further, although there is depreciation of land with a building when being assessed for inheritance tax, it is beneficial to retain even those buildings that are subject to negative externalities such as low efficiency in the usage value or dangers to the vicinity, such as fire and environmental degradation, for tax avoidance. Therefore, even when demolishing and converting the land to a new use or converting it to a vacant land lot without negative externalities is thought to be the reasonable option for society and for the land owner, this is artificially obstructed.

Fixed assets tax constrains general investment in buildings including superior ones and obstructs the effective utilization of land. Furthermore, it is inconsistent even for large buildings with poor quality negative externalities by constraining disposal. At the end of the day, the Japanese tax system lacks integrity and consistency for land use and policy-driven objectives.

4.4 Titling System, Real Estate Registration Tax, Circulation Tax, and Land Liquidity

As noted above, Japan's titling is not a rights transfer requirement but a perfection requirement. Since there is also no titling obligation, it becomes difficult to record the title if there is little actual benefit for immediate tiling even when inherited or traded because of the difficulty in generating adequate profit or the low risk of double trades. However, this does not mean it is disadvantageous for the owner. Conversely, registration is not available online and the procedures are also complicated, so the general course of events is to request the services of a specialist (e.g., a judicial scrivener), which causes a burden for the applicant of both cost and time. In addition, the burden of the real estate registration tax is always a constraint on the transfer of ownership itself, and the corresponding transaction costs reduce the liquidity of land to that extent.

Furthermore, in Japan, the titling procedures are strict, and it is difficult to imagine that anyone but the true owner is registered as the title deed holder. Therefore, there has been a high probability that the registered title deed holder was the true owner at least at some point of time in the past.

The problem is that the search for the true owner beyond the registered title deed holder tends to become difficult because of factors such as successive inheritances. The title does not accurately reflect the transfer of the relationship of rights that stem from the true owner. It is often a mere reflection of information at a particular point in time in the past. In addition, the registered information has not been digitized and searching is not easy, so it is hard to use as a database.

Stamp duty, real estate acquisition tax, and other factors are further impediments to the circulation of what was originally low liquid real estate, and the extent to

which taxes cause a burden on transactions reduces the possibility of effective utilization of land.

Eventually, factors such as the tax and titling systems act as barriers to the transfer of land rights, obscuring the true relationship of rights following the transfer of rights or, at least, the information for the true owner at a particular point of time in the past. Further, the function of public notice from the title is not working properly, and the true owner is difficult to identify.

4.5 Response Through Land Expropriation for Public Business

4.5.1 Imperfect Function of the Expropriation System and Unknown Ruling (Ruling Without Knowing the Owner's Identity)

Land expropriation is possible for businesses with a highly public nature.[12] Article 29, paragraph (3) of the Constitution of Japan, states the following: "Private property may be taken for public use upon just compensation therefor." The authority to expropriate property rights in certain circumstances means divestment against the owner's intention is condoned and the representative legal enforcement is prescribed in the Expropriation Act (hereinafter, the "Expropriation Act"). Article 3 of the Expropriation Act lists businesses qualified for expropriation. Essentially, these are the operators of facilities supplied to multiple unidentifiable persons, including roads, embankments, dams, facilities for erosion control, railways, ports, airports, sewerage systems, schools, and libraries in accordance with laws, but the implementing organizations also include private sector companies and Incorporated Educational Institutions. Although the implementing organizations were originally limited to public institutions such as national and local public organizations, operators of housing facilities with 50 or more dwellings per housing estate are also deemed to be qualified expropriation businesses. Thus, it should be noted that private property that is not always used because the owners are unknown is also being granted expropriation rights (Article 30).

Furthermore, Article 20 of the Expropriation Act states that to be granted approval for expropriation, there is a requirement that the undertaking for public

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[12]Fukui (2012), pages 110 to 111, positions the land expropriation system as a transaction cost measure. Fukui (1998a) suggests the improvement in benefits to multiple residents as well as the maximization of the aggregate amount, time cost savings, and business costs savings, particularly in relation to the requirements of items (iii) and (iv) of Article 20 of the Expropriation Act. Fukui (1998b) criticizes the so-called illegal inheritance theory that allows for disputes against illegal certified projects through the expropriation ruling that takes account of the intent of the expropriation system for quick legal confirmation of the business and the intent of the Administrative Case Litigation Act.

interest (i.e., business operator) is any of the businesses listed in Article 3 of the Act (Article 20, item (i)); the expropriator is a person who has sufficient intention and capacity (Article 20, item (ii)); the undertaking for public interest plan contributes to appropriate and reasonable use of land (Article 20, item (iii)); and expropriation or use of land is necessary for the public interest (Article 20, item (iv)). Of particular importance are the requirements in items (iii) and (iv) for the need to be in the public interest and for the fact that it is appropriate and reasonable use of land. With regard to the requirement in item (iii), as a result of the trade-off between the public profit that should be gained through the provision of the expropriated land for business and the lost profit that this causes, this is permitted under the interpretation of an established court precedent if the former is more beneficial than the latter.[13]

In light of the fact that the Expropriation Act is the implementation act for the Constitution of Japan for the protection of property rights, at least as an intent of the legislators, the concept of "public use" in Article 29, paragraph (3) of the Constitution of Japan, is embodied through the requirements of Article 20, items (iii) and (iv) of the Expropriation Act. Thus, two points can be anticipated. First, there is no issue if the implementing organization is in the private sector and the principle is that the business is provided to multiple unidentifiable persons (A). Second, the profit derived from the business exceeds the profits that are lost (B).

The former justifies the sacrifice of the property rights of a few identified landowners, and this cannot be considered fair if it entails only the profit of a few identified persons; this is the basis of the intent reflected in Article 14 of the Constitution of Japan. The latter is also a standard for efficiency premised on the economic freedom assumed by the Constitution of Japan.

These two are also two large norms in economics. From this perspective as well, the approach to the protection of property rights under the Constitution of Japan and the Expropriation Act can both be seen as friendly for economics.[14]

The Expropriation Act's undertakings for public interest are determined by the Minister of Land, Infrastructure, Transport, and Tourism or a prefectural governor according to the scale of the business, etc., but in recent years, much of the administration of undertakings for public interest by the Minister of Land, Infrastructure, Transport, and Tourism have been transferred to the control of regional area departments and bureaus as part of the rights of regional areas. As part of the research activities of the "Working Group on Land with Unknown Ownership," the three-party joint group at which the author is a deputy chairperson, with Chairperson Masaaki Iwasaki and committee members Junji Annen, Katushiko Itagaki, and Shuhei Yoshida, we conducted interviews of multiple trustworthy persons responsible[15] for the practice of site compensation and expropriation in August 2017 concerning the practice of land expropriation and site acquisition circumstances

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[13]Tokyo High Court ruling July 19, 2012 (Supreme Court HP), etc.

[14]Fukui (2012) pages 92 to 94.

[15]To avoid any trouble to the relevant party even in the worst case, the author refrains from mentioning specific organizations and names at the present point in time.

(hereinafter, "expropriation in practice interviews"). These indicated that in the past, the Minister's undertakings for public interest were only handled by the Minister of Land, Infrastructure, Transport, and Tourism and the interpretation and operation were at least unified in relation to matters handled by the Minister. However, at present, the materials required for each department and bureau when applying for the approval of undertakings for public interest are the interpretation of the requirements under Article 20, items (iii) and (iv), and there is disparity in matters such as the period required for prior administrative instructions.

The disparity among prefectures is even greater, and there are not necessarily many people who can accurately give direction concerning the legal interpretation and operations with adequate confidence, owing to circumstances such as the lack of experience of the responsible person and the virtual absence of expropriation incidents at departments and bureaus as well as prefectures. When finding a person responsible who had no experience, there was confusion about judging the requirements on whether something could be seen as an undertaking for public interest and a long time could pass without direction.[16]

The Expropriation Act also keeps a close watch on the reduction of procedural costs. Even if the name and address of the land owner, etc. are unknown, where "those who cannot be identified by the expropriator, if the expropriator was not negligent in being unable to do so," the information need not be included in the application documents for the ruling (Article 40, paragraph (2) of the Expropriation Act), but there is a requirement to attach proof of no negligence to the application (Article 17, item (ii) of the Ordinance for Enforcement of the Act).

Although not a law or ordinance, the Ministry of Land, Infrastructure, Transport, and Tourism Policy Bureau's "Guidelines for investigating beneficiaries pertaining to applications for unknown rulings" (dated May 23, 2014; hereinafter, the "Guidelines") refer to the ordinary scope of investigation in accordance with matters such as title, certificate of residence, family register, and the fixed asset tax ledger as an example and indicate guidelines for such identification documents. Even when deciding on expropriation, the expropriation committee may make a determination if it is clear that the name and address of the owner, etc. cannot be ascertained (Article 48, paragraph (4) and Article 49, paragraph (2) of the Expropriation Act).

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[16]The author himself worked at the Ministry of Construction, Planning Bureau, General Affairs Division from 1981 to 1983 as the person responsible for matters such as the interpretation, operation, and litigation of the Expropriation Act. At the time, the practice was for only this Ministry to handle undertakings for public interest by the Minister. Previous expropriator hearings occurred, in principle, only once, and it took roughly three months from the initial discussion until the real application. Interpretation operations were also discussed at the division meetings once a week. Precedents and past administrative examples concerning various questions and inquiries from multiple sources nationwide concerning the interpretation of the Expropriation Act, operations, and loss compensation were thoroughly investigated, and there was swift and accurate unified interpretation under the final judgment of the Assistant Director at the time. Even in relation to undertakings for public interest according to the Minister and even if the person responsible was different, there was a unified approach to the operations, with careful attention paid to ensure the requirements under Article 20, items (iii) and (iv), in particular, did not vary greatly.

The Guidelines state the following: "The expropriation committee's level of investigation rights is at the same level as would be required by the expropriator and spending excessive effort and time with a coercive detailed investigation would not be welcome even from the intent of the Expropriation Act. Therefore, the expropriation committee shall mainly confirm if the investigation by the expropriator was appropriate, and shall be required to quickly issue a conclusion if approved as appropriate." Rulings in line with these types of procedures are referred to as unknown determination.

Further, the Expropriation Act also keeps watch to ensure that the ownership of expropriated land is certainly transferred to the expropriator through the expropriation of land and that such legal effect is quickly stabilized. It clearly separates matters that should be determined by parts concerning the efficacy of the ruling, for example, the "area of the land" to be expropriated (Article 48, paragraph (1), item (i) of the Expropriation Act), the time of the acquisition of rights (Article 48, paragraph (1), item (iii) of the Act), time limit for vacation (Article 49, paragraph (1), item (ii) of the Act)), and the "compensation for loss" (Article 49, paragraph (1), items (i) and (ii)).

Although the former can be contested as revocation litigation using administrative litigation, the latter is not recognized as a dispute under administrative litigation. Instead of the expropriation committee being the administrative agency, the action must be filed by the relevant party who is the applicant for the determination and the expropriator who will pay the loss compensation if disputed by the person harmed by the expropriation (Article 133, paragraphs (1) and (3) of the Expropriation Act).

Conversely, Article 48, paragraph (4) of the Expropriation Act, which is the basis provision for the unknown ruling, provides "The expropriation committee must make a determination on the matter set forth in paragraph (1), item (ii) (author's note, compensation for loss) . . . specifying the name and address of the landowners . . . to receive the relevant compensation; provided, however, that if the name and address of the landowners . . . cannot be ascertained, this does not apply to the relevant matter." Thus, the name and address of the owner, etc. are effectively clarified as a ruling concerning loss compensation for the recipient of the loss compensation, and even in the case of a legal dispute, it will not be administrative litigation but subject to the concern of loss compensation for relevant party litigation (Article 133, paragraphs (2) and (3) of the Expropriation Act). Therefore, the dispute must be fought between the person harmed by the expropriation and the expropriator.

That is, even if the expropriator or the expropriation committee were to make a mistake concerning the true landowner not in error but in bad faith, it would only be in relation to whom the loss compensation is to be paid and the true owner would request the expropriator that the legitimate loss compensation should be paid to him or her as the counterparty, which should resolve the relevant party litigation. In other words, as long as one is excluded from being subject to revocation litigation, owner error or deficiencies in the search for an unknown owner will not be a reason for

revocation. Owner error, regardless of the level of such error or bad faith, has absolutely no impact on the efficacy of the ruling.[17]

Furthermore, even for a trial involving a claim for loss compensation, matters that should be settled will, at least in light of the loss compensation prescribed in the Expropriation Act, be the amount that requires liquidation when there is excess or deficiency compared with the true amount of loss compensation anticipated by law. There will also be no impact on the conclusion of the judgment regarding the level of effort put into the search for the unknown owner of the land in accordance with the determination proceedings for unknown ownership by the expropriation committee or the application of the expropriator's ruling. It is only natural that there would be no reason for a legal interpretation that could have an impact.

Therefore, even from the structure of the Expropriation Act, the owner's payment would only have the meaning of being the payee for the loss compensation amount, so this is not anticipated to incur an enormous amount of time and effort. Although there is no security measure in terms of the administration of justice, a legal duty of the expropriator and the expropriation committee is the requirement that the expropriator should search for the name and address of the landowner to the extent that there is no error while the expropriation committee should mention the name and address of the landowner if identifiable in the ruling documents. However, such error has absolutely no impact on the legal efficacy of the ownership transfer to the expropriator through expropriation, and the problem of the payee for the loss compensation amount is anticipated to be a dispute only with a separate relevant party. Thus, this is the extent to which the Expropriation Act intends the quick stabilization of the efficacy of expropriation once it has occurred regardless of the name and address of the landowner.

Meanwhile, according to the interviews of expropriation practice, the actual administrative instructions of the expropriation committee were not limited to matters mentioned in the Guidelines, and there were requirements for onsite investigations and questioning of local residents for a person's new address not only in Japan but also overseas and in the case of a foreign owner, a requirement to identify and confirm the person. Specifically, there were many examples of extremely excessive operations such as situations wherein there were ongoing requirements to search for the name and address of the owner that were gradually extended without specifying the extent of the search operation. Such operations were often conducted on an intuitive basis without legal arguments of confirmation or safety.

This can be attributed to the person responsible at the prefecture and to the chairperson of the expropriation committee, in addition to committee members who do not adequately understand the intent to which the Expropriation Act is a legislation for the protection of property rights under Article 29 of the Constitution of Japan by way of "promoting the public interest taking into account private

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[17]On this point, during the period when the author was the person responsible for the Expropriation Act, it was also the established interpretation operation for the relevant bureau of the Ministry of Construction.

property, thereby contributing to the appropriate and reasonable use of national territory" (Article 1 of the Expropriation Act) in circumstances that have not been exhausted.

The time for site acquisition is determined to be the period to institute the public nature of the business. The ongoing extensions of unproductive search operations that are not anticipated under laws and ordinances are not circumstances anticipated by either the Constitution of Japan or the Expropriation Act.

In addition, even if there is a mistake in relation to the owner due to error or bad faith, there is no option for defect or illegality concerning litigation to revoke the expropriation ruling. At most, since it is a matter concerning the person to whom the loss compensation is due, the form of legal dispute for a ruling under the Expropriation Act in relation to such excessive adherence to this type of matter is split into administrative litigation and relevant party litigation. The efficacy of the ruling is a fundamental legal matter that directly relates to the area of land and contravenes the legal intent to enforce settlement.

Furthermore, in subsequent interviews by the author of certain relevant persons in expropriation committees, it was clear that many people with responsibility for administering expropriation believed that a mistaken owner due to error would be a reason for revoking the ruling, if such a situation transpired. It is amazing that many within an expropriation committee, which is a neutral and fair determining body for land expropriation, are likely to have made mistakes in the rudimentary interpretation of the Expropriation Act. This type of thinking should not even be possible. If one were to become the defendant and dispute a ruling, to ensure the "legality" concerning the owner search that can be easily proven at a later trial, despite having no legal basis and being useless or perhaps illegal, it appears the excessive requirement for the owner search that tends to be put on the expropriator by the expropriation committee is the main cause.

At the end of the day, despite accurate means being set under the Expropriation Act, which has very clear requirements to enable site acquisition due to unknown determination for qualified expropriation businesses, errors in legal interpretation and operations as well as the ignorance or lack of understanding of the person responsible raise questions about the inadequate application of the land expropriation system and unknown determination.

4.6 Steps to Resolve Obstructions to the Effective Utilization of Land with Unknown Ownership Considering the Cause: Prevention and Ex-Post-Facto Measures

As argued above, there are two issues with the problem of land with unknown ownership. These are the various problems in the legal system that are the cause of the problem and the various problems in the legal system that are bottlenecks for the

utilization of land with unknown ownership. The former can be considered a problem to be prevented, whereas the latter constitute a problem that requires ex-post-facto measures. The following presents the ideal policy-driven response, largely from a transaction cost measure perspective for each of these two issues.

4.6.1   Prevention Policies from the View of What Caused There to be Land with Unknown Ownership

Improve the Tilting Ownership and Public Notice Systems

Reporting Obligation for the True Owner and Its Public Notification

The current titling system does not indicate the name in the body. The registered title deed holder is highly likely to have at least been the true owner at some point in time, but there needs to be information about the current true owner such as the person's heir or the counterparty in the sale–purchase transaction. To this end, titling only provides useless information. Either registration needs to be mandatory or measures need to be introduced that require public notice of the true beneficiary with the establishment of an alternative and simpler public notice system of ownership if registration is to be considerably stricter and burdensome.

In that case, although it does not mean that the title must necessarily be adhered to, the title will become an enormous public resource and the first alternative to improve the scheme to enable simple and rapid registration while also applying the title. If this proves difficult, a system other than registration would be fine, but where there is inheritance or a transfer of ownership, the obligation to report the true beneficiary and broad public notification could be considered a vital policy and a fundamental response to the prevention of the circumstances of successive unknown owners.

Principle of Titling Perfection Requirements

Note that the principle of titling perfection requirements in the relationship with the situation of unknown ownership is not necessarily harmful, and there is not necessarily a reason for it to be abolished.

Simplification of Titling Procedures

The complicated and burdensome administrative procedures relating to titling require substantial simplification. Online application should be the principle, and aspects of the application, such as the style and procedures, should be as simple as possible so that even the owner himself or herself can complete the procedure.

Abolition of Real Estate Registration Tax

As already argued, real estate registration tax is one obstruction to the transfer of land ownership and the effective utilization of land. The tax should be abolished except to the extent of the minimum level of fees to cover costs.

The Public Notice of Land Information Approach

Title information and, in particular, information concerning the true owner and beneficiary should not only appear in the register but also be made public through notice on a website in real time. In conjunction with this, since a public notice system is to be created, it would simultaneously be desirable, given the ballooning land information and where it is significant for transactions, to have the utmost comprehensive land information database that discloses public land valuation information (e.g., the public notification of land prices, the investigation of land prices, valuation of fixed assets, and inheritance tax assessment) and the aggregation of publicly entitled land use regulation information such as urban planning and building regulations.

In addition, there should be an obligation for landowners and others to submit contact information such as postal address, email address, and telephone number. This should be made as simple a procedure as possible online.

Improve the Tax System that Obstructs the Circulation of Land and Buildings

The stamp duty on land and building transactions is a substantial obstruction to transactions in the same manner as real estate registration tax and has the effect of obstructing the effective utilization of land. It should, in principle, be abolished or at least substantially reduced. Similarly, real estate acquisition tax should also be abolished or substantially reduced.

Revise Land Tax

Tighten the Tax Rate on Fixed Assets Tax and Market Value Evaluations

The amount of fixed assets tax on land should be legislated to not exceed around 20% of the amount calculated by multiplying the market value of land by the land rent equivalent rate. This should be decided by considering measures that do not take away most of the profit from land and that consider the balance with interest income tax.

In addition, the "market value" evaluation of fixed assets tax that in some cases leads to overly expensive operations should, at the very least, maintain the balance

with the capitalized value in the market while further strengthening the constraints under laws and ordinances with particular attention paid to ensuring that such evaluation does not exceed the market value.

Consider the Cost to Adjust Rights in the Market Value Evaluation

For land with intricate relationships of rights, as in the case wherein there are multiple beneficiaries making the procedures and usage difficult in practice, there is room for correction of the estimated market value with the cost to adjust such rights. For example, when there is a negative value after subtracting the costs to reconcile the rights from the market value, there is a certain rationale for a tax exemption.

Introduce Land Capital Gains Tax and Unrealized Profit Interest Tax

Land taxes that can ultimately increase the liquidity of land to the highest while restraining the effect of a freeze on land transactions regardless of the change in the price of land are land capital gains tax together with unrealized profit interest tax.[18] These tax systems should be introduced in future, and there should be radical revision of the land tax system including land transfer income tax. At that time, the fixed assets tax should be a tax on the acquisition price of the land in accordance with the benefit derived from administrative services and infrastructure. Unrealized profit interest tax rate is collected separately against the market value minus the acquisition price every year, but the fixed assets tax rate needs to be much smaller than the unrealized profit interest tax rate.[19]

In any event, a high rate of fixed asset tax not corresponding to the benefits, such as nearby public service and public welfare facilities, is harmful because it tends to obstruct the effective use of land and fosters the condition of unknown ownership.

The overall land tax system needs to be revised with transformative changes, taking economics knowledge into account to find an appropriate balance.

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[18]There is still no alternative to the land capital gains tax scheme indicated by Iwata (1977), Iwata et al. (1992), and the neutral tax scheme at the time of sale with virtually the same effect indicted by Hatta (1988), and this is a tax system that gives ultimate priority to promoting the effective utilization of land with virtually no side effects. The above documents by Iwata already provide proof that there is no reason for the assertion that land transfer tax should be reduced and land ownership tax increased to promote the effective utilization of land as was often seen in the past.

[19]Iwata et al. (1992) from page 214. This is because of the need to increase the tax burden on landowners with large unrealized profits to offset the freeze effect.

Correction of Distortion in Inheritance Tax Assessment

The reduction in evaluation for a land lot with a building and for a house for rent in the land evaluation when calculating inheritance tax distorts the neutrality concerning land use and leads to excess investment in buildings while promoting inferior buildings, thereby obstructing the effective utilization of land. This type of distortion obstructs appropriate transactions and further accelerates the situation of land with unknown ownership. There should be the same land evaluation regardless of the presence of a building on the land or whether the house is for rent, and the inheritance tax assessment should be applied equally so that there is no harmful bias toward land use in the tax system.

Revise Fixed Assets Tax on Buildings

Abolition of Fixed Assets Tax on Building that Do Not Cause Negative Externalities

The fixed assets tax on buildings only leads to a constraint on investments in safe and comfortable buildings, the effective utilization of land, and the circulation of land as well as harming the incentive to clarify the relationship of rights. It has no merit and many demerits. Even the benefits from the public service and public welfare facilities that increase the utility of land only belong to the land, so there is no reason to apply the fixed assets tax on buildings from this perspective either. It is no exaggeration to call it an example of a harmful useless tax system, and, in principle, it should be completely abolished.

However, buildings with inferior earthquake resistance, fire resistance properties, and inferior environmental performance as well as vacant house and houses overflowing with garbage cause negative externalities to the neighborhood, so taxing such buildings can be rationalized as a Pigouvian tax that internalizes the negative externalities corresponding to the level of the negative impact on the neighborhood.

Abolish the Reconstruction Cost Method for Evaluating the Fixed Assets Tax on Buildings and Change to an Acquisition Price-Based Method

Even if the fixed assets tax on buildings persists until it is abolished, the evaluation method should abolish the reconstruction cost method and shift to an acquisition price-based method. That is, in principle, the method should be corrected to one that is based on the price at the time of purchase or contract with accumulated depreciation. In addition, there is no rationale for the current method that has a lower limit for depreciation of up to 20% of the reconstruction price. As the phrase states, to reflect "market value," depreciation should be allowed to go below 20%.

It is self-evident that the reconstruction cost method will tend to result in divergence from the actual market price, and this most likely contradicts the original

principle of the Local Tax Act to tax "market value." It is no exaggeration to state that this evaluation method could be considered close to illegal. Since the reconstruction price is virtually always higher than the actual building value, it is convenient for securing tax revenue but deviates from the intent of holdings tax that taxes actual profit and creates an excessive burden on the target taxpayer. Further, by making the holding of old buildings generally more disadvantageous than new constructions, it prevents the circulation of existing homes, obstructs the liquidation of land and the effective utilization of land, and fosters land with unknown ownership.

Essentially, the fixed assets tax on buildings should be abolished. However, during the foreseeable future when buildings with the fixed assets tax continue, the method of evaluation should be changed to one that is based on the price pertaining to the purchase or contract at the time of acquisition with depreciation corresponding to the evaluation in the market. However, even in this case, factors that are superior and that reduce the negative externalities on the neighborhood, e.g., investments contributing to the improvement of safety, the environment, and comfort, surpassing the lower limit prescribed by the Building Standards Act, should mean that the increase in the amount over the acquisition price required to form added value in the building is deductible.

In addition, since the reconstruction cost method is complicated and burdensome, the tax bureaus of many local government bodies allocate specialist employees to that task alone, which incurs enormous administrative costs. Thus, there is also no reason from the perspective of eliminating waste and improving administrative efficiency.

Note that essentially, buildings are property with utility when combined with land, and it is difficult to calculate the capitalized value for a standalone building. Were the value that belongs to the building to be calculated, the original building price would need to be calculated by deducting the market price for the land as a vacant block of land from the market price of the building together with the land. When calculating the price using the method based on the acquisition price, the calculation needs to be balanced with this price.

Improve the Co-ownership System and Inheritance System Under the Civil Code: Restrict the State of Co-ownership

The state of co-ownership of property rights is fundamentally undesirable from the perspective of increasing the cost to adjust rights and transaction costs. The management of land and building is much more complicated than for personal property, so the costs of rights adjustment need to be completely reduced even just from the perspective of the transaction costs. Furthermore, land and buildings cannot exist solely without impact on others, so real estate should be considered to have a certain level of positive or negative externality. Therefore, the permission of an unlimited state of co-ownership with the same property rights, akin to personal property without externalities, is, as a principle, an inefficient ownership system that does

not take account of the constraints inherent in property rights. Although the current Civil Code is also not necessarily favorable toward co-ownership, its systemic collateral is not exhaustive.

Since the state of co-ownership increases transaction costs and is the original cause of unknown ownership of land and buildings, there should be a regulation of co-ownership by two or more owners after a certain grace period with sole ownership as the principle.

Similarly, even for schemes of co-ownership of land through unit owners, there is no rationale from the perspective of transaction cost measures. Hence, in future, condominiums should be prohibited from allowing the legal state of unit owner condominiums. Permits should only allow for sole owners of a wing or of an entire complex, and it would be appropriate for joint housing to only permit rental condominiums.

Furthermore, for inherited lands and building, the permission for co-ownership before the establishment of split discussion and the legal approval of such co-ownership through split discussion or wills serve to increase the transaction costs for adjustment between owners concerning disposition and management and are the main cause for exacerbating the subsequent problem of the unknown ownership of land.

Therefore, in essence, the co-ownership of land and buildings through a will should be prohibited, and even in the case of a legal inheritance, there should simultaneously be a treatment so that there is sole inheritance of the land and building with a certain automatic priority. The adjustment of inherited property between heirs should be through the distribution of cash on selling the property or liquidation through cash to persons not inheriting the land and buildings.

4.6.2   Promote the Use of Land with Unknown Ownership

Unify the Operation of the Land Expropriation System and Aggregate the Implementation Organization

Qualified expropriation businesses ultimately deposit loss compensation amounts without knowing the owner in accordance with the system of unknown determination for unknown ownership regardless of whether the expropriator is public or private and enable the transfer of rights to the expropriator through expropriation. However, as already noted, expropriator organizations are not necessarily accustomed to expropriation in practice. Owing to the lack of examples because of the small number of organizational units responsible for the administration of expropriation rulings and undertakings for public interest, there are few employees skilled in operations relating to the Expropriation Act on both the application and trial sides. In addition, there has not been a thorough application of a unified strict legal interpretation or operations as an act for enforcement of the Constitution of Japan. As a result, the expropriator, the agency certifying the project, and the expropriation

committee face considerably uncertain hurdles in obtaining an approval for the undertaking of an operation or unknown determination.

Therefore, expropriators, agencies certifying the project, and the expropriation committee should be reviewed to enable the pursuit of the benefits of scale when processing administration such as during the aggregation of operations into certain large organizations. Operations with extremely powerful authority, such as practical expropriation, must aim at being based on strict monocracy principles and must avoid encompassing a relationship with local political interests while avoiding a move toward excessive separatism.

Along with this, the matters that should be noted when unifying matters such as the operations under the land expropriation system should be further documented and made official by the Ministry of Land, Infrastructure, Transport, and Tourism with an aim to further enlighten and ensure common awareness.

Improve Unknown Determination

As already discussed, the current operations concerning unknown determination under the Expropriation Act tend to require search obligations placed on the expropriator that are in excess of the legal expectations. Even for business with high levels of community and public interest, there is a tendency to obstruct such realization when it includes land with intricate relationships of rights.

Therefore, for the time being, the content of the current Guidelines should not stop at being administrative guidance but should be positioned as the laws and ordinance entrusted under law.

In addition, when there is an obligation for registration and the public notice of true ownership, if there is no reply to a notice sent by post to the contact point, for example, to the registered address, or if the notice is returned to the sender because the addressee is unknown, the expropriator shall take the position that he or she is not mistaken in being unable to learn the name and address of the owner. There should be no obligation for further searches, and the expropriation committee should have no legal requirement for additional searches.

Implementation of a Ruling Scheme for the Disposal and Use of Land for Private Sector Businesses

Even for private sector businesses and businesses that are not qualified for expropriation, where land is necessary for the business, it is not appropriate for society if this comes to a standstill because of the difficulty of reconciling rights with landowners.

Schemes Where a Business Is of a Certain Public Nature

To be positioned as a business that directly qualifies for expropriation under the Expropriation Act, the business must qualify as "may be taken for public use" (Article 29, paragraph (3) of the Constitution of Japan). To achieve this, it is necessary to provide certain unidentified multiple uses (A) at the same time as ensuring the profit gained by the business exceeds the loss of profit (B). However, there are many private businesses that, although not necessarily providing unidentified multiple uses, would generate profit by providing the land to such business in excess of the profit that would be lost through such action.

The concept of "may be taken for public use" in the Constitution of Japan as a principle anticipates the case of "use" contrary to the owner's intention, so strictly speaking, if all owners are unknown and such intent cannot be confirmed, it will not necessarily be contrary to the relevant parties' intent. Where expropriation is necessary even if there is a determination of unknown, if the requirements of both A and B are met, the definitive transfer of ownership to the expropriator can be rationalized even if the intent of the landowner cannot be confirmed.

However, in the case that B is applicable but A is not, it is desirable from a socioeconomic perspective for the business to be realized. Further, where the action would be contrary to the intent of the owner, it is only natural that there needs to be direct expropriation procedures, but if the owner is unknown and it is difficult to confirm such intent, the interpretation should be that it is definitely not in contravention of the Article 29, paragraph (3) of the Constitution of Japan in that certain usage rights are set under a certain public ruling for such business.

From this perspective, the current investigation of systems[20] relating to land with unknown ownership by the Ministry of Land, Infrastructure, Transport, and Tourism granting a certain period of usage rights for temporary facilities, regardless of whether by a public or private entity, that can be restored to their original state as public type businesses that invest in the welfare of local residents is rational.

Note that as a problem of limitations in Article 29, paragraph (3) of the Constitution of Japan, as long as the investigation is made from the perspective of business necessity, were there less factors of A (unidentified multiple uses) and only for a few identified private uses, if B is met with a use that is desirable from a socioeconomic perspective, and, in addition, if there is a high probability that the true owner would profit from the rental or sale to provide such use, even when it makes sense to estimate that one wants to gain transactional profit from the rental or sale for such business use as the intent of the relevant party, the transaction may not happen and the land use may stall. Actual problems of this type cannot be resolved if it is considered to be a mere problem of positive externalities and restriction of private rights for public goods.

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[20]December 5, 2017, Interim summary presented by the special subcommittee of the National Land Council Land Policy Committee (Draft) from page 8.

Scheme of Legal Fiction for the Owner's Intent as a Transaction Costs
Measure

As already discussed, the essence of the problem of land with unknown ownership,
be it a case where it is hard to apply the unknown determination for the qualified
expropriation businesses or a case where it is hard to establish the transaction for
private business of the private sector, is a transaction cost problem due to the
difficulty of decision-making concerning the types of procedures and management
and whether to sell or not or rent out or not without identifying the intention of the
land owner because the land in a certain unit necessary for business with an intricate
relationship of rights is in a state of shared ownership.

    If the land has a sole owner, the decision-making transaction cost is zero, and
when there is a buyer who places a higher value on the land than the owner's
reservation price, the transfer of ownership or setting of a right of lease will cause the
transfer of rights to a person with a high probability of ensuring more efficient land
use, so there is no effort required or time cost for decision-making and improvement
in efficiency can be easily realized.

    However, where there is co-ownership of land, as already discussed, even a
decision to rent a property cannot be made without the intent of the majority interest
and decision-making needs to be unanimous if the land is to be sold. Thus, even in
cases where the names and addresses have been clearly identified, enormous trans-
action costs are required to obtain agreement of intent between co-owners.

    Although these costs for decision-making cannot be avoided even if the relevant
parties are identified, when directly confronted with the problem of land with
unknown ownership, the transaction costs for decision-making become even more
astronomical in the case of a lack of clarity concerning the relevant party being the
owner.

    Therefore, as a measure to reduce the transaction costs pertaining to the decision-
making of the landowner being the relevant owner, building a new scheme regard-
less of the public nature would create a more essential solution than investigating the
loosening of the bond of certain businesses in the pursuit of the limitation of the
curse of public nature.

    In terms of the unanimous principle concerning common property procedures in
the Civil Code, the systems for reconstructing condominiums and selling their lots
have already breached the legal system. The land for condominiums is co-owned,
and the dwelling part takes a troublesome form of rights that involves substantially
complicated decision-making by the unit owners. In the case of detached houses and
rental condominiums of sole ownership, in principle, repairs and refurbishments and
all acts such as demolition and reconstruction and sales of vacant plots of land are
certainly easy because they are only subject to the owner's intent.

    By contrast, in the past, condominiums were treated the same as common
property under the Civil Code, and procedures such as reconstruction were not
possible without a unanimous decision. After consideration of the unrealistic trans-
action costs associated with this, the so-called Act on Building Unit Ownership, etc.,
and the Act on Facilitation of Reconstruction of Condominiums now require

resolutions for reconstruction and resolutions to sell lots to be determined by 80% of voting rights, etc. However, in actuality, such a resolution is extremely difficult and even for condominiums that are deteriorating or have inferior earthquake resistance, it is extremely rare for them to be reconstructed or turned into vacant lots. There are very few successful examples of reconstruction even among the stock of condominiums that have suffered enormous deterioration, and many condominiums facing problems persist as inferior buildings because of the difficulties of reconciling rights; there has already been much discussion from multiple practitioners and researchers on the topic.[21]

Nevertheless, the intent of exceptions in the Civil Code for common property procedures for condominiums is no reason to cause public nature to attribute for the neighborhood, such as so-called externalities and public goods. Many owners are relevant parties, and there are many cases of conflicts with mutual interest. Thus, based on the high probability that the requirement for adjustment of rights to be unanimous will increase the transaction costs and distort land use considerably, schemes have been established to allow the agreement of intent, such as reconstruction resolutions, to be reached more easily by the relevant parties as a transaction cost measure to promote private property management procedures. In this sense, the principle of common property procedures pertaining to condominiums is not derived from Article 29, paragraph (3) of the Constitution of Japan.

There will no doubt also be circumstance where future unit owners become unknown because of the progressive deterioration of condominiums. In such cases, a problem similar to the problem of land with unknown ownership will emerge in the form of "the problem of condominiums with unknown unit owners," and many condominiums will likely find it difficult to reach the 80% vote required for resolutions.

In this sense, the response of loosening the special majority requirements as a substitute for the unanimous principle, similar to the one used for common property procedures in the Civil Code, cannot radically resolve the problem of unknown owners. In essence, true owners exist, but the fact that their intention is not clear is the root of the problem, and as long as this persists, an enormous amount of effort and cost will be incurred in searching for such intent. Since it is unreasonable to provide land to a person who could potentially make effective use of the land who wants to buy it and for the owner to be unable to secure profit on land, it is not an erratic action as a transaction cost measure that a public entity is involved in making legal fiction of the reasonable intent of the owner acting as an agent for the decision-making that can infer what is considered to be the essential rationale.

Therefore, where it is not possible to confirm intent because the owner is unknown, including the case where some co-owners are unknown, such intent should be created as legal fiction acting as agent for the decision-making with the establishment of a deposit scheme for the sales proceeds and rental revenues until the

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[21]See submission included in Asami et al. (2012).

true owner appears. In such cases, it will be necessary for the agent to not only use the land but also to definitely conduct the acts of disposal such as its sale.

Abolition of the Unanimous Principle for Common Property Procedures: Simplify the State of Shared Ownership Resolution

The argument in section "Implementation of a Ruling Scheme for the Disposal and Use of Land for Private Sector Businesses" concerning the scheme of legal fiction of the owner's intent as a transaction cost measure is a more fundamental measure, but the current provisions for the management of common property in the Civil Code also increase the transaction costs and need to be improved. At the very least, it is not desirable to constrain the use of land and buildings. Furthermore, in certain circumstances, as long as there are externalities because of land use, there is no rationale to the original principle of unanimity under the Civil Code for common property procedures.

It should be made possible to permit the disposal of land and buildings with a majority or a special majority of about two-thirds of their entire value. This type of scheme is likely to result in it being easy to resolve a state of shared ownership. This is also the direction in line with the original intent of the Civil Code.

4.6.3 Land Not Liquidated Even If It Minimizes Transaction Costs

Thorough Tax Exemption for the Fixed Assets Tax: Constraints on Investment in Public Service and Public Welfare Facilities

Even if the rights adjustment costs are minimized through the aforementioned policies, for land that does not have a high value of use, indicating little possibility of liquidation, and that is difficult for even the owner to use, there should be thorough tax exemptions for the fixed assets tax.

Even from the perspective of securing the financial resources to improve public service and public welfare facilities and administrative services, which is the original function of the fixed assets tax, it is difficult to rationalize a certain public investment in the vicinity of the land even if the market value does not become positive. Consequently, nominal investment to increase the value of use of land in the vicinity of the tax-exempt land is nothing but a sunk cost, and this type of investment should be constrained.

System for Renouncing Ownership and Inheritance in Relation to Land and Building

Land with little usage value should be levied with a certain management fee, and it should be possible to renounce ownership for public management. The restraint on the use of land of owners without incentive to use the land has meaning as a measure for negative externalities of land use.

Similarly, apart from the current renunciation of inheritance (renunciation and qualified acceptance) for land without usage value, there is scope to establish a system of renunciation of sole inheritance independent from other inherited property. In this case, as with the renunciation of ownership, a certain management fee should be collected and there should be public management.

Non-participation in Land with Little Usage Value

Even when rights adjustment costs are priced in and without any reason for belonging to public management, land with little usage value signifies that it is not suitable for public participation. Land without value is a waste of public funds, so there should be no public spending nor participation of administrative employees regardless of whether it is nominally for gathering information, assistance, or business.

Measures for land with unknown ownership should only be targeted at land that has a certain possibility for effective utilization.

4.7 The Connection Between Urban Aggregation and the Problem of Land with Unknown Ownership

The delineation system for urban planning, Location Normalization Plan, and residential guidance zone systems are all aimed at improving the efficiency of investment in infrastructure through urban aggregation. However, in recent years, a progressively aging population and declining birth rates have meant that the concentration of various functions for the traditional population has been focused on urban centers, and the image of the city on which the traditional form of urban policies for urban expansion and the urban sprawl have been based is being challenged to transform. Thus, many areas will be forced to assume urban images that are scheduled to contract.

Essentially, each type of policy for urban aggregation and compact city policies, for example, will lead to a polarization of preservation and application of land in areas on the outskirts of cities and in rural areas according to their potential use. However, as already discussed, if there is a transformation to a more appropriate land transfer tax and fixed assets tax, the negative externalities of land use will be restrained and function as automatic stability mechanisms to drive fair ways of

spending tax, without relying on invocations of very ineffective rights of land use regulation that will meet with strong political resistance.

A tax system and investment cycle that reinvests within the scope of revenues from land fixed assets tax and to the extent of increasing the land values will achieve an aggregated urban structure that is safer and better for the environment while simultaneously constraining wasteful public investment. This type of reorganization for the urban structure will increase the liquidity for land that is suitable for effective utilization in the center and most likely mitigate the problem of land with unknown ownership. Even if public organizations do not artificially participate at all costs in relation to urban and regional areas, as long as the locations are those that are required and activated naturally regardless of whether the land usage is a public or private entity, it will accelerate the effective utilization of land and foster a positive cycle with positive externalities of land usage in the vicinity.

From this perspective, the local government body that is currently involved in taxing fixed assets tax does not correspond to the benefits or burden for each public service and public welfare facility. It will have a reason to conceptualize the idea of the "local government body" for each facility that should unify tax and investment as a unit. Dealing with the problem of land with unknown ownership will essentially be driven by implementing this type of concept of a local government body, which should allow for a more effective realization.

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Chapter 5
Realities and Challenges of Land Issues in the Era of Depopulation

Shoko Yoshihara

Abstract Abandoned and unclaimed land has emerged as a major policy issue in Japan, where the population is dwindling and property values are falling in many areas, including big cities. This article analyzes this alarming issue using the results of a nationwide survey conducted by the author targeting 1719 local authorities, which revealed a disconnection between the existing landownership system and rapid demographic change. Policy initiatives are needed to address three basic challenges, namely, how to get people to register title transfers when they inherit real estate; how to protect and manage land that has no immediate prospect for use; and how to improve the data collection and management infrastructure.

Keywords Unknown owners · Depopulation · Landownership · Inheritance · Registration

5.1 Emergence of Land of Unknown Ownership

While rural areas are depopulated and land prices continue to decrease, there have been reports from across Japan regarding cases of what is referred to as "lands of unknown ownership" for which the location or existence of the owner cannot immediately be determined. This is an obstacle to local public interest in terms of issues such as post-disaster recovery, elimination of abandoned farmlands, and countermeasures against vacant properties.

On October 26, 2017, an announcement was made by the Abandoned and Unclaimed Land Issues Research Group, founded by former Minister of Internal Affairs and Communications Hiroya Masuda and others, stating that, if things remain as they are, abandoned and unclaimed land will increase to approximately 7.2 million hectares by 2040, causing a total economic loss of approximately

S. Yoshihara (✉)
Tokyo Foundation for Policy Research, Tokyo, Japan
e-mail: yoshihara@tkfd.or.jp

6 trillion yen, thus making the issue a topic of public interest (Preliminary Data 2017).

5.2   Issue of Unregistered Inheritances

A major factor in being unable to determine the whereabouts or existence of the landowner is the issue of unregistered inheritances. Generally, when the owner of land or property dies, the inheritor who is the new owner carries out the procedures to register the inheritance and to transfer the title on the real estate register to his or her own name. However, inheritance registration is not an obligation, and making the decision as to whether and when the title transfer procedure should be made is left to the judgment of the inheritor.

For that reason, if inheritance registration is not performed, the title on the real estate register is left in the name of the deceased, and the land is in actuality used by one of their heirs. Later, as time passes and generations come and go, the legal inheritors grow exponentially, and the information on the registry becomes detached from the actual situation.

This situation is not illegal per se because inheritance registration is voluntary rather than obligatory. However, it is an obstacle in cases where a third party wishes to contact the owner and there are talks about newly using such land. In order to make use of such land, first, the legal inheritor must be specified by researching the kinship of all inheritors and making an inheritance succession chart based on official copies of the family registry with all inheritors and on the copies of their certificates of residence. Subsequently, consent must be obtained from all inheritors for the register title transfer.

This process requires even more time and expense if, for example, there is even one person among the inheritors who cannot be contacted due to their whereabouts being unknown or because they are living overseas.

In recent years, unregistered inheritance has become a nationwide issue due to land becoming unusable because the whereabouts of the owner are unknown.

5.3   557 Local Authorities "Have Had Problems"

What, then, is the actual situation across Japan? Tokyo Foundation for Policy Research, a private think tank, conducted a survey among tax offices in 1718 municipalities and in metropolitan Tokyo (23 wards) in the autumn of 2014 in order to quantitatively understand the realities of this issue (Tokyo Foundation for Policy Research 2016). The aim was to understand the reality of "unknown ownership," albeit indirectly, by investigating the occurrence of issues such as specifying fixed property taxpayers (landowners) for unregistered inheritances. Responses were obtained from 888 local authorities nationwide (response ratio: 52%).
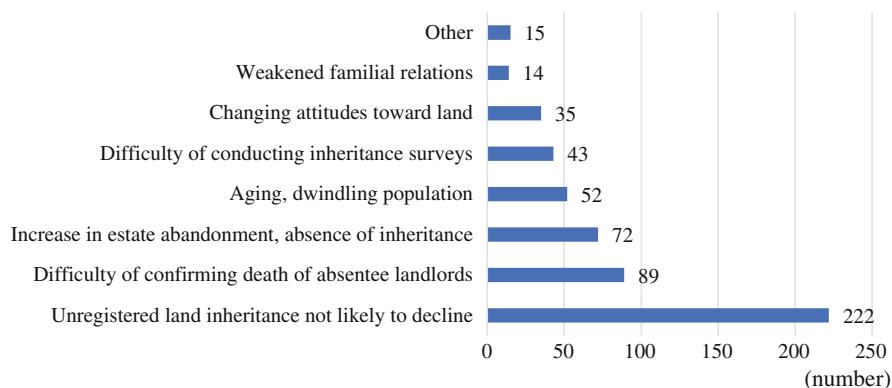
Fig. 5.1 Reasons for increase in decedent tax. Source: Tokyo Foundation for Policy Research "Unknown ownership of land—the reality of issues demonstrated by a survey of local authorities" 2016

Five hundred fifty-seven (63%) of the local authorities responded "Yes" to the question, "Have you ever experienced problems due to being unable to specify a landowner?"

With regard to the multiple choice question about the specific type of issue, the highest response rate was for "Difficulty in collecting fixed property tax" (486 local authorities), followed, in almost equal numbers, by "Registration of deteriorated vacant properties as dangerous properties" (253 local authorities) and "Decay of land due to neglect" (238 local authorities).

Next, "decedent tax" was investigated. One hundred forty-six local authorities (16%) responded affirmatively regarding cases of unregistered inheritances in which the tax office had not followed up on investigating the inheritor, and tax had inevitably remained in the name of the deceased person. The ratio of taxpayers (who were not subject to land tax exemptions) was 6.5%. Seven local authorities (1%) responded negatively. Seven hundred thirty-five local authorities (83%) responded "Unknown," which shows the difficulty of accurately understanding whether owners are still living.

They were subsequently asked whether they believed that decedent tax would increase in the future.

As a result, 770 local authorities (87%) said "Yes" or "Probably."

When asking about the reasons for this in a descriptive format, the responses were largely split between institutional factors and social factors. First, with regard to institutional factors, 222 local authorities said that the increase in unregistered inheritances was due to the complexity of procedures and the major expense among other factors. Furthermore, some of the responses also pointed out that it is difficult to find out about the death of a person living outside the municipality, and that inheritance surveys are difficult to conduct due to the increase in absentee landlords (Fig. 5.1: Shaded bars).
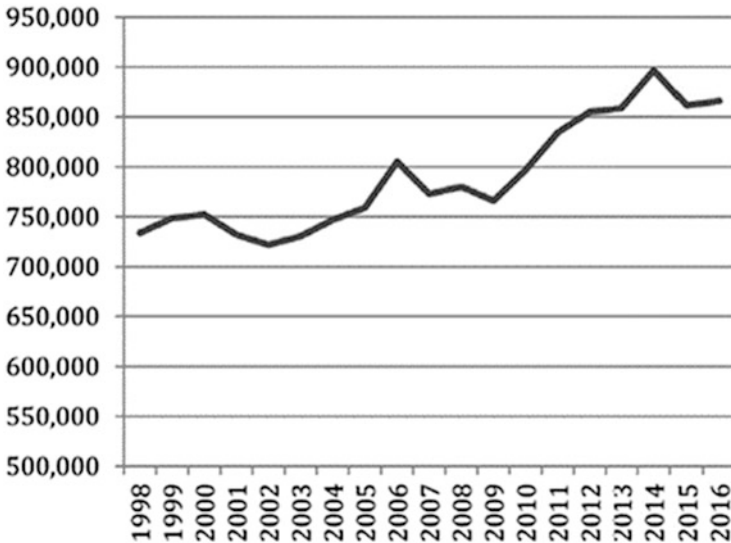
Fig. 5.2 Transition in title transfer registration due to inheritance, etc. (1998–2016). Source: Produced by the author based on registration statistics from the Ministry of Justice (n.d.)

In the case of the death of a taxpayer who is not registered as a resident by the local authorities (absentee landlord), there are no structures in the current system for notifying the local authority concerned of the death. For that reason, as long as there is no tax payment notification submission or arrears and no report from the inheritor, it is difficult to find out about the death of the taxpayer if inheritance registration is not performed. In addition, the inheritance survey may be further complicated when the owner's certificate of residence has been disposed of after the retention period (usually five years) following the death of the owner or transfer of residence.

Next, the social factors that were cited include increased estate abandonment due to low land asset values and the burden of managing the property, and the difficulty of cooperating on the partition of the estate due to weakened familial relations.

Specifically, the answers included statements such as the following: "land trading has stagnated, and, increasingly, substantial problems do not initially arise even if inheritance registration has not been correctly carried out"; "the inheritor no long lives in the area, and many people do not know the location of the land that they own, such as mountain forests and fields"; "there are many cases in which the land is a burden (in terms of annual tax) rather than being profitable, so the inheritors do not want to take it on"; and "there is a low value to fixed properties in depopulated areas, so, increasingly, the children of the owners do not return to the local area and have less of an attachment to the property."

Furthermore, among the responses, regarding the handling of land with absentee owners due to inheritance abandonment, some commented that, although there are systems for inheritance asset management, for example, there are many examples in

which land is inevitably neglected as it is not thought to be cost effective, which, in reality, leads to institutional or legal challenges because of the uncertainty relating to the responsibilities for managing the land and determining the identity of the rights holder.

These results bring the overall structure of this gradually emerging issue to the surface, which shows that the difficulty of finding landowners (taxpayers) is due to societal changes such as depopulation and an aging society as well as the inflexibility of the current system.

5.4   This Issue Will Inevitably Worsen If Nothing Is Done

Two observations can be made based on the results of these surveys. First, the issue of land of "unknown ownership" is not a temporary or local issue; rather, it is affecting local authorities across Japan on a regular basis. Second, flaws in the system are fostering this issue.

The foundations for understanding information regarding the actual ownership and use of land in Japan are lacking. Various registers have been produced with different objectives, such as the real estate register, fixed property tax ledger, and the agricultural land register. However, the content and accuracy of these registers are not consistent, and there are no structures that enable a centralized understanding of this information. The national land survey (definition of areas, boundaries, owners, etc., for sections of land), which is the foundation for national land management, is only 50% complete, despite having started in 1951. Meanwhile, in comparison to other countries, individual ownership rights are extremely strong.

Of the various registers, although the real estate register is a source of important owner information, the registration of the individual ownership right is voluntary, as stated above. The real estate registration system is a structure that was originally intended to protect rights and ensure the safety of transactions, and it is not a system that enables the government to understand landowner information. Even if registration is made, the owner on the registry is not obligated to provide a notification of the change of address after moving house.

The foundation of land information in Japan is formed of structures in which accuracy is affected by market trends and personal actions. When viewing a given piece of land as a constituent of national land, a major challenge is that the establishment of information, which is the basis for the land policy, is dependent on individual discretion. This issue has been left almost undiscussed until now.

The choice of whether and when to register the inheritance is influenced by the individual's circumstances and economic and social factors; for instance, the property market may become more active due to an upswing in the economy. For example, when land prices rise due to the stimulation of property transactions in urban areas, owners have a stronger desire to sell and they will perform inheritance registration in preparation for that, or the owner may register many years after

receiving the inheritance in order to sell the land if it becomes the target of an increase in public works.

Figure 5.2 shows the transition in the number of cases of title transferal due to inheritance, etc., from among all land registrations. Although the number has been rising in recent years, it is clear that there are fluctuations each year.

When considering the declining demand for land due to depopulation and the changing awareness of people with regard to land, it does not seem likely that inheritance registration will be proactively performed in the future under current structures.

According to the "Land Issue Awareness Survey" conducted every year by the Ministry of Land, Infrastructure, Transport, and Tourism (MLIT), regarding the question, "Is land as valuable an asset as savings or stocks?" those who responded "No" in 2016 were at the highest level (42.1%) since the study began (Land Economy and Construction Industries Bureau 2017).

This is approximately twice that of the ratio in 1993 (21.3%). In particular, by region, the ratio was higher in rural areas (43.6%) than in major urban areas (39.7%). As land prices continue to decrease, in many regions, it is difficult to justify the concept of "land as an asset."

Comments from judicial scriveners included the following: "agricultural land and mountain forests are nothing more than a burden, and it is difficult to produce an inheritor"; "recently, there have been cases where consultants have said that clients only want to register residential land and that mountain forests can be left unregistered"; and "although registration should be done for the sake of the next generation, I am hesitant about pushing registration too much."

If the neglect of vacant properties and abandonment of agricultural land is referred to as "neglect of management" by the owner, leaving the name of the deceased person on the registry for decades by failing to register the inheritance can be called "neglect of rights."

However, this issue does not normally come to the surface. It is only when it comes to using agricultural land, promoting countermeasures for vacant properties, or when disasters occur that the reality becomes apparent.

5.5 Necessary Countermeasures in the Future

What countermeasures may be required in the future?

Interviews conducted by the author with relevant parties including local authority officials, legal officials, and real estate-related businesspeople have highlighted three major points in relation to discussions about countermeasures to prevent the unknown ownership issue from worsening.

5.5.1 Improving Inheritance Registration

To prevent the occurrence and increase of the issue of land of unknown ownership, many of the relevant parties pointed out that, in the future, the most important and urgent challenge is inheritance registration.

In the medium term, while promoting a review of the ideals of inheritance registration, first, an improved policy must urgently be sought based on the current voluntary inheritance registration.

Some local authorities are carrying out their own plans locally. In the survey of local authorities mentioned above, one local authority stated that "land that has not been registered as an inheritance is listed as 'Not inherited' on the tax statement issued to taxpayers in April each year. This has led to a gradual increase in inheritance registration."

In addition, it is necessary to prepare several countermeasures according to the type of issue so that inheritance procedures are simplified and so that there is no obstacle to the use of land in areas with outdated registration records.

5.5.2 Need for a Means to Deal with Land of Unknown Ownership

The second important point as a countermeasure in relation to this issue is the formation of a means of dealing with and using land where the ownership is unknown. While the population is decreasing, there is more land that is being unused. In the survey of local authorities mentioned above, when asked about the real situation of requests from residents for land contributions, land donated by residents to local authorities was limited mostly to cases in which there was the expectation of official use, such as for roads. Essentially, if an owner is unable to maintain their land, it is preferable that this becomes "everyone's property" or that other structures are put in place to enable new trade or usage methods.

However, currently, such options are limited. It is necessary to create a new means of dealing with such situations from the perspective of land preservation and public good so that the neglect of such unused land does not lead to physical decay or complications in connection to the rights of unregistered inheritances.

5.5.3 Improving Land Information Infrastructure

A third point in discussions about countermeasures for the issue of unknown ownership is improving infrastructure relating to land information.

As application for inheritance registration is voluntary, it is difficult to understand landowner information under the current real estate registration system. To

overcome this fundamental issue, it is necessary to have structures to effectively understand the minimum amount of basic information that is required by making a maximum use of the current registers.

Regarding agricultural land information, the "Agricultural Land Information System" has been operating since 2014 for the centralized management and publication of national agricultural land information. Regarding forests, in the 2016 revision to the Forest Act, municipalities became obligated to maintain a forest register for information such as forest owners and boundary measurements, and to publish those details in part.

In order for the various registers to function effectively, it is important that information is shared between systems to the greatest extent possible. By standardizing the published basic information (owner name, address, date of birth, gender, etc.), ensuring data compatibility, and forming consistent rules, information can be effectively provided and shared.

5.6 Appropriately Handing Down Land to Future Generations

Current land systems in Japan were established when Japan was formed as a modern nation in the Meiji era, and they were revised and amended during the period of high economic growth after the war. These systems were formed primarily to deal with "overuse" due to rising land prices and chaotic development rather than depopulation and various accompanying challenges. The issue of land of unknown ownership is a structural challenge that has developed in the gap between the current system and social changes, and there is no panacea for resolving this issue immediately.

First, it is necessary to establish a concept of national land preservation on the premise of population decline and to create various methods suited to each region based on a shared nationwide foundation while also utilizing the systems built up since the Meiji era. In particular, land system reforms cannot be promoted without the understanding of citizens because it is an issue that involves property rights.

In the government's policy guidelines for 2017 that were established by the cabinet in June 2017, regarding the effective use of abandoned and unclaimed land, it was stated that "the aim is to present a bill at the next ordinary session of the Diet." While land prices continue to decrease, and the concept of "land as an asset" ceases to exist, what kind of structures should be formed to hand down land to future generations? Positioning land issues as a challenge for a society with a decreasing population necessitates the promotion of a review of the present system.

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Chapter 6
The Negative Effect Factors of the Land Acquisition System for Profit-Oriented Enterprises in Order to Promote Economic Growth

Yuichi Ohya

Abstract The Land Acquisition (Amendment) Act of 1991 in Malaysia for economic growth has institutionally enabled arbitrary land acquisition. This paper reveals what is the fundamental determinant of the negative effects on the legal system concerning land acquisition for economic growth. As a result of this study consideration, the article of property rights within the limits of the law enables governments to have a broad discretionary power and liberalizes policies governments can implement. However, this study concludes policies that make light of personal assets will obstruct economic growth in the long run.

Keywords Land Acquisition Act in Malaysia · Public vs. profit-oriented land acquisition · Economic growth · Flexible discretion to management · Social welfare

6.1 Introduction

The land acquisition system in Malaysia is a system that forces the provision of land it owns with compensating the land owners by the state authority with power to acquire land for public purposes and economic development.

The original title was "The Negative Effect Factors of t[1]he Land Acquisition System that Encompasses Non-Public Purpose for Economic Growth", but in this book with emphasis on simplicity, it is described as "The Negative Effect Factors of the Land Acquisition System for Profit-Oriented Enterprises in order to Promote Economic Growth". Also, in the text, some sentences were revised as the notation was changed from "land acquisition for non-public purpose" to "land acquisition for profit-oriented enterprises".

Y. Ohya (✉)
Yokohama City University, Yokohama, Japan
e-mail: y_ohya@yokohama-cu.ac.jp

In ASEAN countries, land acquisition (land recovery in Vietnam and Land Requisition in Laos) for public purposes has been established. Excluding Myanmar and Laos, specific requirements of land acquisition, for example social capital development and national security, etc., have been stipulated.

Vietnam and Malaysia, in particular, are characterized by admitting land acquisition for economic development in addition to land acquisition for public purposes. The advantage of land acquisition for economic development is to increase land use efficiency and promote economic growth by transferring land ownership to more productive operators. Land recover for economic growth in Vietnam is limited to the construction of industrial parks, etc., but the area where land acquisition is possible in Malaysia is not limited under the Land Acquisition Act 1960. In addition, Malaysia's land acquisition is permitted to provide land for corporations to conduct profit-oriented enterprises, and these are different from Vietnam.[1]

As an institutional issue of land acquisition for profit-oriented enterprises, bribery can be caused because it is directly linked to the profits of private companies. The existence of bribery is a problem in many countries. This study examines the negative impacts on the implementation of economic policy when the operation of land acquisition for profit-oriented enterprises and bribery are linked and what kind of factors it depends on in the legal system design.

The structure of this article is as follows. In Chap. 2, the existing research is organized, and the viewpoints of consideration are arranged from the viewpoint of the negative effect factor of land acquisition system and land acquisition in each country. Chapter 3 confirms the transition of economic policy after the independence of Malaysia and background of Land Acquisition Amendment Act of 1991 and analyzes the changes in income inequality in Malaysia. It also shows the difference between the acquisition requirements of the Land Acquisition Act enacted in 1960 and the 1991 Amendment Act. In addition, this chapter indicates results of survey on corruption and bribery in Malaysia and the bribery of state government-related parties revealed in court are presented. Chapter 4 organizes the Malaysian legal system from the provisions of the federal constitution that restrains the administration and conditions the legislation with regard to the characteristic of the separation of three powers, property rights, and the allocation of power between the federation and state on land administration. In Chap. 5, based on the matters confirmed so far, this study considers institutional issues in land acquisition for profit-oriented enterprises and negative effect factors to economic policy, and shows the conclusion.

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[1]In addition, except in the case of voluntary acquisition, the amount of compensation for land acquisition is determined by the administration in Malaysia. This point is different from Vietnam. Ishida (2006) reports that with regard to compensation for land recovery under the 2003 Revised Land Act in Vietnam, if an agreement has been reached between the landowner and the business operator, the agreed amount is adopted as the amount of compensation for the land recovery.

6.2   Review of Previous Studies

6.2.1   Land Acquisition

The application of land acquisition to agricultural land has become prominent in rapidly industrializing countries, especially China and India (Ghatak and Mookherjee 2014). Ghatak and Mookherjee (2014) analyze the compensation policy for farmers who expropriated farmland during the process of industrialization. Dell'Angelo et al. (2017) show that commons are targeted for land acquisition in 44 of 56 cases in 27 countries. More than half of that were small farm lands.

As a matter of dealing with land acquisition in the Asian region, Miyamoto (1993) conducts a comparative study on public land acquisition systems in Malaysia, Thailand, Indonesia, and the Philippines. Ooi and Sirmans (2004) prove the existence of the wealth effects on land acquisition in Singapore.

Regarding land recovery in Vietnam, Ishida (2006) clarifies institutional changes brought about by the marketization of land use rights and the issues raised by land recovery disputes aimed at economic development. Tuyen et al. (2014) quantify the impact of farmland losses on household livelihoods. Tuyen et al. (2014) find no econometric evidence for the negative impacts of farmland losses on income and expenditure per adult equivalent. In addition, Tuyen et al. (2014) show that farmland loss has an indirect positive impact on household welfare, via its positive impact on the choice of nonfarm-based livelihoods.

Looking at other than ASEAN, Ju et al. (2016), which investigated land acquisition in China, prove how land acquisition in urbanization affects labor allocation decisions of farmers. The results show that land reduction has a significantly positive effect on the probability and share of household nonfarm labor allocation. As for the harmful effect of land acquisition in China, Hiramatsu (2012) points out that no uniform law has been enacted in the acquisition system and shows concern that administrative legislation that is haphazardly enacted and abolished is a factor which causes confusion in society. Jiang (2013) reports that the profits of land acquisition have led to overexploitation and bribery cases in China. Sato (2012) organizes economic and legal theoretical issues regarding the land acquisition problem in India.

The literature dealing with land acquisition in Latin America is scattered and not enumerated one by one, but there is a study dealing with land acquisition in Brazil (Miyasaka Porro and Shiraishi Neto 2014).

Previous studies dealing with land acquisition in Africa have been on the rise in recent years. Recent studies include German et al. (2013), Nolte and Voget-Kleschin (2014), and Kleemann and Thiele (2015).

6.2.2   Negative Effect Factors on Land Acquisition System

In Japan, efficiency and justice (fairness or equality) are pointed out regarding the framework of legal system design discussed in administrative law (Hirai 1995; Abe 1996). Though it is necessary to examine how well the concept of welfare assumed by economics matches the meaning of welfare discussed in law, the discussion from the economic point of view on how to secure social welfare is not enough.

There are many empirical studies on corruption. In a recent study, Cooray et al. (2017) show that expanding corruption and shadow economy increases public debt. Beblavy (2007) proposes measures that increase the probability of exposing corruption and the cost of corruption, and reducing the benefits of corruption and the scope of administrative discretion so as to prevent corruption.

6.2.3   Literature Related to Land Acquisition in Malaysia

Xavier (2002) points out legislative problems in Malaysia's land acquisition from a legal perspective. Fujimoto (1997) does not show a quantitative evidence, but points out that the purposes of the amendment to Article 3 of the Act, which stipulates requirement for land acquisition, were to expand the manufacturing industry and to develop Malay reserve lands which have been delayed in land development. Salih and Yusof (1989) point out that there is still a lot of room for deregulation and liberalization of the economic structure of land as an issue of distribution policy after the completion of the New Economic Policy (NEP) implemented from 1971 to 1990. At the time of the 1995 general election, PAS (Partai Islam Semalaysia), an opposition party that led the government criticism campaign, increased the vote rate in the state where Malay farmers had criticized the government regarding land acquisition (Torii 1996).[2] It cannot be denied that land acquisition due to the revision of the law provokes public oppositions.

Zhang (2005) and Pakhriazad and Shinohara (2005) show that the connection between business operators and politicians in Malaysia affects the business. Pakhriazad and Shinohara (2005) shows that administration can take wrong actions through bribery to politicians.

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[2]Although PAS increased the vote rate as a whole, including Johor, which is called "UMNO state", the number of seats won was seven, unchanged from the 1990 general election. UMNO (United Malays National Organization) is the largest party of the ruling coalition (Torii 1996).

6.2.4 Summary

Existing studies that simultaneously consider legal system design from three perspectives, administrative discretion, social welfare (social benefits), and corruption (bribery or bribe), are not sufficient. In addition, existing researches that consider land acquisition from two perspectives, system design and negative (harmful or abuse) effect (influence), are insufficient.

The amendment of the Land Acquisition Act in Malaysia in 1991 is a law revision as an economic policy. Hence, when considering such a law revision, it is necessary to consider not only the legal system but also its suitability as an economic policy. Studies about land acquisition in Malaysia have been accumulated on adequate compensation associated with land acquisition (Xavier 2002; Alias and Nasir Daud 2006; Alias et al. 2010), but studies dealing with trying to consider land acquisition simultaneously from both legal system and economic policy perspectives are not enough.

Therefore, this study focuses on Malaysia, which has introduced the land acquisition system for profit-oriented enterprises for the first time in ASEAN countries.[3] Then, this study elucidates the negative effects of the combination of land acquisition for profit-oriented enterprises and bribery and reveals the institutional factors of these negative effects. The discussion focuses on institutional issues on land acquisition for profit-oriented enterprises and negative effect factors in economic policy from the case of land acquisition in Malaysia.

6.3 Changes in Economic Policy after the Independence of Malaysia Leading to the Revision of the Land Acquisition Act in 1991

This chapter provides an overview of Malaysia and analyzes the changes in income inequality in Malaysia, taking into account the changes in economic policies and the process leading to the revision of the Land Acquisition Act in 1991. In addition, this study compares the land acquisition requirements of the 1960 Land Acquisition Act and the 1991 Amendment Act and shows the results of investigation on corruption and bribery in Malaysia and the bribery of state government related parties revealed in court.

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[3]Land recovery for economic development in Vietnam's 2003 Revised Land Law is clearly distinguished from land recovery for public purposes.

Fig. 6.1 Gini coefficient, Malaysia 1970–2004. Source: Created by the author from Economic Planning Unit. Note: Data for 1970, 1974, 1976, 1987 peninsular Malaysia only
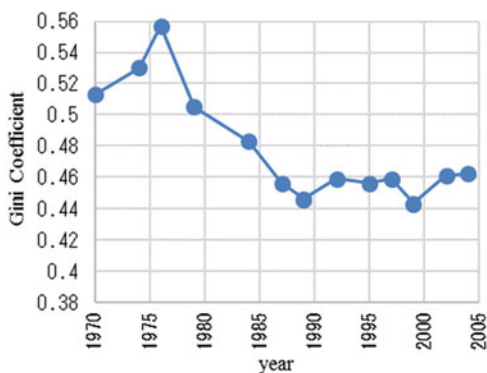
6.3.1 Overview of Malaysia and Changes in Economic Policy

Malaysia became independent from the United Kingdom on August 31, 1957, as the Federation of Malaya. In 1963, the Federation of Malaya was merged with the current Sabah and Sarawak States in Borneo to form Malaysia.[4] Malaysia has a constitutional monarchy (Westminster-style parliamentary cabinet system) and is a federal state consisting of 13 states (11 Malay Peninsula and 2 North Borneo). Malaysia is a multi-racial country, and out of 30.99 million people as of 2015, Bumiputra (meaning "Sons of the soil"), mainly Malays, accounted for 61.8%, Chinese 21.4%, and Indians 6.4% (Department of Statistics, Malaysia n.d.). After its independence from the United Kingdom, Malaysia had adopted a liberal economic system called Lesser Fail which the government had not intervened in the market. However, NEP had introduced from 1971 to 1990, triggered by the racial riots (13 May Riots) that occurred in 1969 due to the economic disparity between Malays and Chinese.[5] NEP's policy objectives are to improve economic disparities between races and reduce poverty. The economic policy after the end of NEP was implemented to admit the temporary widening of inequality for economic growth from the realization that economic growth is necessary as a pre-stage of income redistribution. This direction can also be found in the Land Acquisition Act revised in 1991 after the end of the NEP. In fact, the Gini coefficient in the whole of Malaysia, which represents the level of income inequality, stopped at 0.446 in 1989. In the 1990s, the Gini coefficient had increased and stagnated between 0.456 and 0.459 until 1997. In 1999, the gap showed a narrowing of 0.443, but after that the figure had risen again (Fig. 6.1) (Economic Planning Unit, Malaysia n.d.). After NEP (1971–1990), the National Development Policy (NDP) was implemented from 1991 to 2000.

Focusing on the Gini coefficient for each race (Fig. 6.2), the income gap among the same races had been widening until the late 1990s during the NDP period. The figure of Chinese showed a decrease prior to Bumiputra and Indians in 1997, but

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[4]Singapore separated from Malaysia in 1965.

[5]The NEP is characterized by the Malay preferential, also known as the Bumiputra policy.

Fig. 6.2 Gini coefficient by Ethnic Group 1970–2004. Source: Created by the author from Economic Planning Unit. Note: Data for 1970, 1974, 1976, 1987 peninsular Malaysia only
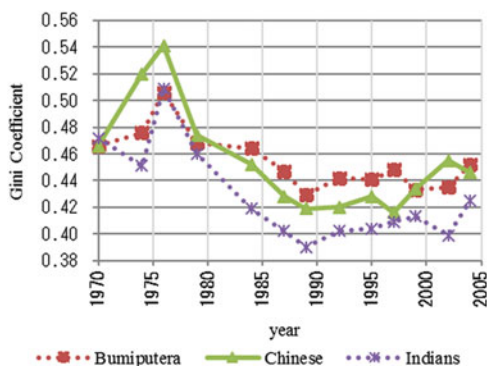
Table 6.1 Income disparities between races and regions (median)

Year	Bumiputra/Chinese	Bumiputra/Indians	Rural/urban
1970	1:2.23	1:1.62	1:1.91
1976	1:2.06	1:1.55	1:1.97
1979	1:1.94	1:1.54	1:1.83
1984	1:1.82	1:1.33	1:1.74
1987	1:1.73	1:1.31	1:1.61
1989	1:1.73	1:1.31	1:1.59
1992	1:1.76	1:1.33	1:1.86
1995	1:1.76	1:1.36	1:1.85
1997	1:1.84	1:1.48	1:1.87
1999	1:1.75	1:1.38	1:1.80
2002	1:1.74	1:1.34	1:2.00
2004	1:1.66	1:1.33	1:2.69

Source: Created by the author from Economic Planning Unit
Note: Data for 1970 and 1976 peninsular Malaysia only

from 1997 to 2002, the figure of Chinese had shown a widening gap again. The Gini coefficient for Indians, Compared with Bumiputra and Chinese, had remained small, but the gap between Indians during the NDP period had been behind Bumiputra and Chinese.

Looking at income disparities among the races (Table 6.1), the income disparities between Bumiputra and the Chinese had been narrowing under the NEP, but the disparities had been widening until 1997 under the NDP. Similarly, the income gap between Bumiputra and the Indians had been shrinking under the NEP, but the gap had been widening until 1997 under the NDP. The income gap between Indians and Chinese had been narrowing until 1997, but since then it had been increasing until 2002 under the NDP.

The income gap between rural and urban areas had tended to narrow under the NEP, but the gap showed widening at the beginning of the NDP, and thereafter the gap narrowed in both 1995 and 1997 (Table 6.1).

Based on these data transitions, the redistribution of income had seemed to work mainly from the late 1990s to the end of the NDP. Although the obtained data is not a yearly data, the Gini coefficient as a whole Malaysia during the 1990s NDP period shows a numerical decrease in 1995 and 1999. Also, in terms of income ratio between rural and urban areas, 1995 and 1999 showed a narrowing gap.[6]

6.3.2   The Revision of Land Acquisition Act in 1991

The amendment of the Land Acquisition Act in 1991 is the first year of the NDP. The Land Acquisition Act enacted in 1960 had limited the cases where land acquisition could be done to the public purpose case (Financial Times 1991). Article 3 of the Land Acquisition Act of 1960 stipulated that "The State Authority may acquire any land which is needed—(a) for any public purpose; (b) by any person or corporation undertaking a work which in the opinion of the State Authority is of public utility; or (c) for the purpose of mining or for residential, agricultural, commercial or industrial purposes" as a requirement for land acquisition.

Expansion of Acquisition Requirements

However, the Land Acquisition Amendment Act of 1991 expanded the requirement for land acquisition, and the State authority may acquire so as to provide land to any person or corporation for any project which in the opinion of the State Authority is beneficial to the economic development of Malaysia or any part thereof or any class of the public (Article 3 of Land Acquisition Amendment Act). As already indicated, income doubling and distribution plan are behind the revision of Article 3 of this Act which defines the requirement for land acquisition and as a plan of economic policy after the end of the NEP there is recognition that it is necessary to improve economic growth rate before income redistribution. The amendment of Article 3 is considered to be for the purpose of fulfilling policy goals.

In ASEAN countries, land acquisition (land recovery) for economic development is permitted not only in Malaysia but also in Vietnam. In Vietnam, land recovery aimed at socio-economic development for national or public interest is limited to projects to construct industrial parks, export processing zones, hi-tech zones, economic zones and new urban centers, investment projects funded with official development assistance (ODA) capital, and national important projects approved by the National Assembly (Article 62 of Land Law). However, in Malaysia, the area where land acquisition is possible is not limited, and unplanned land acquisition may be implemented systematically in urban planning.

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[6]It should be noted that Malaysia's general elections in the 1990s were held in 1990, 1995, and 1999.

Discovery of Corruption and Bribery

In Malaysia, the implementation of land acquisition requires the approval of State authority. However, a survey of listed companies on the Malaysian Bourse (Bursa Malaysia), "KPMG Malaysia Fraud, Bribery and Corruption Survey 2013"[7] (KPMG 2013), shows the perceptions of corporate bribery and corruption when doing business in Malaysia. The relationship between bribery of state government-related parties and business licensing has become clear from the process of the trial against land acquisition[8] (Stamford Holdings Sdn Bhd v. Kerajaan Negeri Johor and Ors 1998). Bribery related to the business license seems to have a meaning of starting money for the application procedure. However, given these contents of investigation, trial case, and the prior researches, it is unavoidable to be skeptical as to whether effective acquisition has been carried out after appropriate examination in all land acquisitions.[9]

6.4 Legal System and Structure of Land Administration in Malaysia

This chapter organizes the legal system and the structure of land administration in Malaysia, which are the preconditions of consideration.

6.4.1 Legal System of Malaysia

Malaysia has a system in which three powers are divided under the influence of English law, but it is characterized by the relative strengthening of administrative power. The jurisdiction of the court, which was stipulated to be granted by the Federal Constitution, was changed by the revision of the Federal Constitution in

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[7]Although there is a problem that this survey does not specify the number of valid responses, it is cleared that responses were representing almost 10% of the total number of companies listed on Bursa Malaysia. The survey shows "71% of respondents also believed that bribery and corruption is an inevitable cost of doing business whilst 64% believed that business can't be done in Malaysia without paying bribes".

[8]The application for land development, which had not been approved for 4 years, was approved by the state as soon as 30% equity of the company that owns the land was given to state government-related parties. In the trial, persons who were in a position to procure the necessary approval of the administrative permission for development were parties to the trial as one of the respondents.

[9]In the 2004 general election, the eradication of corruption is put up as one of the ruling party's manifesto, and in the 2013 general election, that is listed as one of the election pledges of the ruling and opposition parties.

1988 to be the jurisdiction granted by federal law. This has eliminated the independence of jurisdiction.[10]

The Federal Constitution as Supreme Law

Article 4(1) of the Federal Constitution indicates that the Federal Constitution is the supreme law of the Federation. The same article also shows that any law enacted after the date of independence[11] and not compatible with the federal constitution will be invalid to the extent it is not compatible with the federal constitution. In addition, under Article 4 and Article 128, each federal court is granted the power of judicial review.

Provision of Property Rights in the Federal Constitution

With regard to what kind of economic policy the administration can implement, it depends on the provisions of the constitution and law that bind the administration. The Federal Constitution is the supreme law of the Federation, giving courts unconstitutional review rights and providing that laws that do not conform to the Federal Constitution are invalid to the extent that they do not. Therefore, legislation that violates the provisions of the Constitution is unconstitutional. However, in carrying out economic policies that involve the restriction of the property rights, Article 13 (1) of the Federal Constitution of Malaysia stipulates "No person shall be deprived of property save in accordance with law". The property rights is attached to the reservation of the law (Gesetzesvorbehalt), and it is possible to limit the property rights depending on the contents of the statute. For this reason, it is a provision that can be legislated to grant flexible discretion to administration regarding the restriction of property rights. The Federal Constitution of Malaysia guarantees property rights only within the limits of the law.

The same Article (2) stipulates that "No law shall provide for the compulsory acquisition or use of property without adequate compensation".[12] With regard to the restriction of property rights, it is necessary to satisfy the two requirements of statutory law and adequate compensation.

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[10]The Federal Constitution of Malaysia has been revised 57 times as of the final revision of 2009 (Constitution of Malaysia n.d.). This amendment frequency of constitution is due to the fact that the ruling coalition BN (Barison Nasional) had secured two-thirds of the parliament's seats, which is a requirement for the amendment of the Federal Constitution.

[11]Merdeka Day: 31 August 1957.

[12]The basic criterion for assessing the adequate compensation on account of land acquisition as required by Article 13 (2) of the Federal Constitution is the market price (First Schedule of Land Acquisition Act). For details, see Xavier (2002).

Limitation of Judicial Review

In addition to the provision of property rights attached to the reservation of laws and enabling administrations to implement flexible policies, Malaysia has provisions to limit judicial review that make it difficult to challenge the administration. In addition to the power of judicial review, Superior Court[13] is given the right of judicial review over the act of administration under First Schedule of Court Act and Order 53 of Rules of the High Court (Kuwahara 2009). However, a special clause called the "Final Clause" often excludes constitutional review and judicial review from application and limits its application. This final clause has provisions in the federal constitution itself, and also in the law (at least the income tax law provides this final clause).[14] Article 8(3) of the Land Acquisition Act in Malaysia provides this final clause.

The basic principle of judicial review is the doctrine of Ultra Vires. In order to claim the invalidation of land acquired by the State government, the landowner who has acquired the land must prove that there is a mala fide or bad faith for the land acquisition. That is, the lawsuit must prove that the purpose of the acquisition is not within the scope of the requirements of Article 3 of the law that establishes the requirements for land acquisition, or that the state government has abuse of authority over land acquisition (S. Kulasingam, and Anor v. Commissioner of Lans, Federal Territory, and Ors 1982). It has been held in court that this proof is not sufficient just because there is a suspicion of allegations (Yeap Seok Pen v. Government of the State of Kelantan 1986). To claim the invalidation of arbitrary land acquisition, the landowner to be acquired must show clear evidence that there is a mala fide or bad faith.

6.4.2 Legislation and Administrative Jurisdiction Over Land in Malaysia

This section shows the legislative authority and administrative jurisdiction regarding the land between the Federation and State that constitute the Federation.

In the Malay Peninsula, the National Land Code 1965 is the general law for land. In Sarawak and Sabah State located in Borneo, the Sarawak Land Code 1958 and the Sabah Land Ordinance 1930 are applied to the respective States.

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[13]Superior Courts are established under the Federal Constitution, and their decisions are "stare decisis (binding force of precedents)". Superior Courts are composed of High Court of Peninsular Malaysia, High Court of Sabah and Sarawak, Court of Appeal, and Federal Court, and the Federal Court is the court of the final trial (Kuwahara 2009).

[14]A typical example of the "Final Clause" is as follows: "final and conclusive", and "shall not be challenged appealed against, reviewed, quashed or called in question in any court of law" (Ōmura 1997).

In Malaysia, State that makes up the Federation has authority concerning land (Article 80 of Federal Constitution and Ninth Schedule List II of Federal Constitution). The alienation of land owned by State to a private person creates private ownership. Then, the land alienated from a State is bought and sold among private individuals, and the distribution of land takes place. In Malaysia, Article 80 of the Federal Constitution and Ninth Schedule of the Federal Constitution provide for the allocation of administrative authority between the Federal government and State government. Ninth Schedule List II of the Federal Constitution, which defines the legislative jurisdiction, shows that States have legislative authority with regard to land-related matters, including forced acquisition of land. For this reason, a State may enact State laws with its own regional validity concerning the matters stipulated in List II, which defines State legislative jurisdiction (Article 73 of the Federal Constitution). All matters States have legislative authority are administrative jurisdiction of that State [Article 80(1) of the Federal Constitution].

In the case of an inconsistency between a federal law and any State law, federal law shall prevail and State law shall be invalidated to the extent that it does not comply with federal law (Article 75 of the Federal Constitution). In addition, so as to unify the laws of several States, Parliament has legislative authority over matters State has legislative authority (Article 76 of the Federal Constitution). Federal law superordinates State law, and its effect extends to all parts of Malaysia (Article 73 of the Federal Constitution). These factors secure the domestic policy uniformity. However, the federal administrative authority does not extend to State administrative jurisdiction indicated by the Ninth Schedule List II of Federal Constitution [Article 80 (2) of the Federal Constitution].

With regard to the development plan covering a single State or multiple States, if, after consultation with related organizations,[15] the King (Yang di-Pertuan Agong) acknowledges that the development plan will contribute to the national interest, and, after the development plan is published, the King may proclaim the area or areas as a development area, and, as a result, despite the matters that only States have a legislative power, the Federal Parliament shall be authorized to put the development plan and any part of it into effect in any matter related to the development plan (Article 92 of the Federal Constitution).

The land administration in Malaysia is based on the above-mentioned legislative and administrative jurisdiction, and except for cases where it is designated as a development area, the state government has a system of discretion.[16] The state government also has the administrative authority for land acquisition (Ninth Schedule List II of the Federal Constitution and Article 80 of the Federal Constitution), and it is not possible to enact federal law contrary to this administrative jurisdiction.

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[15]The King (Yang di-Pertuan Agong), after a recommendation from an expert committee, consults with the National Finance Council, the National Land Council, and the Government of any State concerned.

[16]The Federation can advise the Government of any State (Article 94 of Federal Constitution).

6.5   Consideration and Conclusion

The provision within the limits of the law in Article 13 of the Federal Constitution in Malaysia extend the scope of human rights restriction, as compared to the case where this provision is not within the limits of the law, and may cause new legislative problems in theory. Although repeated revisions of the Federal Constitution have threatened constitutionalism, it is necessary to revise Article 13 of the Federal Constitution to reduce administrative discretion in order to prevent the easy restriction of property rights.

Constitutional provision within the limits of the law increases the degree of freedom of policies that administrations can implement. However, policies that make light of personal property will lose their institutional credibility toward the assets and reduce the people's motivation, and as a result, it is thought that economic growth will be obstructed in the long run. This matter applies not only to Malaysia but also to other countries.[17] With regard to land acquisition for profit-oriented enterprises, business operator can avoid the rise in the selling price of the land that occurs in the process of negotiation for buying and selling land by utilizing land acquisition system, which gives the business operator an incentive to reduce the cost of getting land. This is a factor for the beginning of land acquisition by the business operator.

Extensive discretion of administration enables flexible administrative decisions. On the other hand, if the range of administrative discretion is large, the range in which the administration is leaded to the grant and approval of the project which has deviated from the optimum judgment of the administration for maximizing social welfare will also be enlarged. This occurs through bribery to the administration by the economic entity that tries to increase its own profit utilizing the authority of the administration. Bribery to the administration for securing and expanding private interests hinders the essential role of the administration to maximize social welfare. By this bribery, a sufficient examination cannot be carried out, and the administration can carry out erroneous grant and approval. At the time of revision of the Land Acquisition Act in 1997,[18] a provision was established that the examination for the application concerning land acquisition should be conducted in consideration of the public interest and the feasibility of the project. However, the purpose of this provision may be overwhelmed by bribery to the administration.

Based on the above argument, the universal point of the negative effect factor on the legal system design concerning the grant and approval of the land acquisition (project) of the administration can be arranged into the following three points.

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[17]It can have such an effect not only on land ownership but also on land use rights in countries where private ownership of land is not permitted.

[18]Under the Amendment Act of 1997, the scope of land acquisition requirements has been expanded, and it has become possible to newly acquire land for recreational purpose.

1. The provision of the constitution within the limits of the law increases the degree of freedom of legislation and gives the administration broad discretion (flexible discretion).
2. For administration to have broad discretion, the administration can make decisions that have a negative effect on the accomplishment of the policy goals and decisions that undermine the public's credibility.
3. Administrative decisions that have a negative effect on the fulfillment of policy goals are elicited through bribery that seeks to exploit administrative authority having broad discretion.

Although it depends on the contents of the constitutional provisions of each country, in countries that are legislative based on the constitution and whose administration is governed by the constitution and the law, the above points are not limited to Malaysia, but can be common characteristics in other countries. It is necessary to keep in mind that administration makes mistakes and makes decisions which do not consider the expansion of social welfare. Moreover, system design in anticipation of reducing the degree of "administration failure" seems to be an important aspect in legal system design.

It can be said that further control of administrative discretion based on laws and regulations, including judicial review, is the future task of Malaysia toward becoming a developed country. It is also institutionally possible to narrow the state government's discretion by self-cleansing by the state law established by the legislature, which consists of direct election by residents.

This research considered based on the transition of policy from NEP (1971–1990) to NDP (1991–2000), but after NDP, National Vision Policy (National Vision Policy), from 2001 to 2010, the following NVP has been implemented, and a New Economic Model (New Economic Model, hereinafter NEM) has been formulated from 2010 to 2020. The realization of the "economically fair and equal society" raised as the policy philosophy of NDP (1991–2000) is coming closer to realization in terms of income gap, as Fig. 6.3 shows, from 2007 to 2014.[19] When introducing a land acquisition system for profit-oriented enterprises despite matters that can be negotiated between the parties, as the reason for establishing a land acquisition system that directly contributes to the expansion of private interests, a cause for public purposes, such as securing funds for income distribution to correct the gap,[20] and promoting poverty reduction by promptly promoting economic growth, etc., is required.

The amendment of Land Acquisition Act, which also enables land acquisition for profit-oriented enterprises, took place in 1991, the first year of NDP, when the policy shifted from NEP to NDP. In the process of policy transition from NDP to NVP and

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[19]The Gini coefficient throughout Malaysia in 2014 was 0.401. By ethnic group in 2014, Bumiputra 0.389, Chinese 0.405, and Indian 0.396.

[20]However, developing countries taking a parliamentary system have the possibility of distributing effectively for election votes with considering the time, place, and target people in order to reflect the outcome of economic growth as much as possible in the number of seats.

Fig. 6.3 Gini Coefficient, by Ethnic Group and Whole Malaysia 1970–2014. Source: Created by the author from Economic Planning Unit. Note: Data for 1970, 1974, 1976, 1987 Peninsular Malaysia only
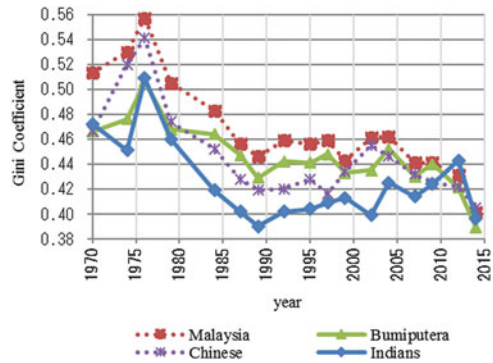
NEM, how the implementation of land acquisition changed, what kind of policies has been taken under NVP and NEM, and what kind of influence the policies have brought about each race are a future research topic.

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Chapter 7
Empirical Analysis on the System Revisions of Judicial Real Estate Auctions: Comparison with General Real Estate Trading

Yusuke Ooka

Abstract This paper shows the effect of a series of system revisions of judicial real estate auction in the 2000s on three factors: bid acceptance ratio, number of bidders, and highest bid. Using multiyear data of auctions from multiple district courts, I estimate the improvement of the three factors by the revision.

Furthermore, comparing real estate auction data with voluntary sale and general real estate trading data, I find that the selling price in auction was greatly lower than the price in voluntary sale even after the system revisions. Based on the empirical results, I suggest about necessity of further system revisions.

Keywords Auction · Real estate · Ordinary least squares regression analysis · Probit analysis

7.1 Introduction

It is said that selling prices for judicial real estate auction transactions are kept lower than trades in the general real estate market due to system distortions such as the restriction on free browsing of property interiors. To address this, the judicial real estate auction system has been subject to multiple system revisions in the 2000s. The ability to sell at a high price in the judicial real estate auction would not only be beneficial for the creditor but also for the debtor. In addition, active provision of property information is also desirable for purchasers. Furthermore, reducing a creditor's collateral risk and providing lower cost funding will also lead to lower interest rates and increased lending volumes in the financial markets thereby stimulating the entire economy. This paper focuses on the impact of the system revisions of judicial real estate auctions. Empirical analysis was conducted on the impact of

Y. Ooka (✉)
Japan Housing Finance Agency, Tokyo, Japan

system revisions on the bid acceptance ratio, number of bidders, and highest bid using many years of data relating to judicial real estate auctions, including unsuccessful bid data. Furthermore, by comparison and analysis of the abundant data for judicial real estate auctions and voluntary sales as well as general real estate trading (observed numbers were judicial real estate auctions 8268, voluntary sales 6181, and general real estate trading 91,984), this paper clarified that there continues to be a large gap in the selling prices for judicial real estate auctions and general real estate trading even after the series of system revisions, so further system revisions for judicial real estate auctions were also examined.

7.2   Previous Research

Previous research on statistical analysis of the judicial real estate auction system includes the following: Taguchi and Ide (2004) calculated the recovery rate and the bid acceptance ratio from judicial real estate auction data in the Osaka District Court to analyze the current state of the auction market and study the role of the minimal sale price. Maruoka (2011) clarified the impact on the highest bid, etc. according to the form of occupancy such as under the suspension of delivery system following the abolition of the short-term tenancy protection system. In addition, Kazumi (2014) clarified the impact of introducing the judicial real estate auction property information site Broadcast Information of Tri-set system (hereinafter, "Broadcast Information of Tri-set system") through a Difference-In-Differences (DID) analysis. Takahashi (2015) analyzed the impact that the revision of the minimal sale price system had on the bid acceptance ratio and highest bid and proposed revisions to the system that prescribes the minimum price basis. Fukui and Kume (2015a), apart from studying the impact that the abolition of the protection of short-term tenancy had on the highest bid, also compared and studied the impact of the short-term tenancy protection on the highest bid before and after the system revision. Reports in international journals include the following: Idee et al. (2011) suggest the state of occupancy for auction real estate affects the highest bid through two paths, namely, the minimal sale price and the change in the number of bidders according to the change in the minimal sale price. In addition, Hoshino and Nakanishi (2016) propose an environment-based economic evaluation method using judicial real estate auction data of the Tokyo District Court.

However, there has been no research to date that has conducted empirical analysis of the series of system revisions over many years using actual judicial real estate auction data, including unsuccessful bids. Furthermore, there has been no research that clarified the extent to which the series of system revision has caused contraction in the divergence between the highest bid for the judicial real estate auctions and the transaction prices for voluntary sales and general real estate trading. So, this paper analyzes the impact of the series of system revisions of judicial real estate auctions, controlling the selection bias by using data that also includes cases of unsuccessful bids, and clarifies the price difference among the highest bid for the judicial real

estate auctions and prices of voluntary sales and general real estate trading; this paper focuses on further facilitating judicial real estate auctions.

7.3 Outline of Judicial Real Estate Auctions and Voluntary Sales

7.3.1 Outline of Judicial Real Estate Auctions

Judicial real estate auctions are procedures aimed at recovering a creditor's claim through a compulsory sale by a court of an owner's real estate in accordance with the Civil Execution Act. The court shall, upon a filing by a creditor, seize such real estate, set a certain period as an auction period and sell such real estate to the person with the highest price presented during that time period, with the proceeds of the sale distributed to the creditor(s).

7.3.2 Outline of Voluntary Sales

Voluntary sales is a system for the sale of collateral real estate in the general real estate market through a real estate broker based on the intent of the debtor, with proceeds of the sale paid to the creditor(s). Real estate sale procedures are handled by real estate brokers, but creditors are able to control aspects of the selling procedures such as the verification of the appropriateness of the selling price. In the case of voluntary sales, selling takes place in the general real estate market, so the property can be sold at a higher price than would be generated through a judicial real estate auction, and since there are fewer required procedures than for a judicial real estate auction, the period up until the sale is also reportedly shorter. Furthermore, there are benefits for the debtor such as for example where moving costs, etc. are approved as a cost deduction. There are examples where creditors have encouraged debtors to prioritize conducting a voluntary sale over a judicial real estate auction projecting that this would accelerate the sale and increase the claim recovery amount (Ministry of Justice: Auction System Study Group 2007).

7.4 Main Revisions of the Judicial Real Estate Auction System

7.4.1 Abolition of the Protection of Short-Term Tenancy

For judicial real estate auction properties, the purchaser through the judicial real estate auction needs to negotiate the eviction with the occupant. The protection of short-term tenancy for such occupants has been thought as the main cause of obstruction for judicial real estate auctions.

A short-term tenancy is, in the case of a lease contract for the building of <3 years, the right that enables perfection of the mortgage even if there is a right of lease set at a later date than for the mortgage set during the contract period.

Misuse of this system by setting a short-term tenancy in collusion with debtors and anti-social organizations such as organized crime groups with the modus operandi to require the purchaser to pay a large eviction fee to the occupant following the judicial real estate auction was prevalent (Fukui 2007).

Protection of short-term tenancy increases the risk for financial institutions as lenders and reduces the supply of funds in the financial markets (a shift to the left on the supply curve). On the other hand, the misuse of such system makes obstruction possible increasing the demand in the financial markets (a shift to the right on the demand curve).But the amount of this increase is smaller than the amount of decline in supply. It is difficult for lenders to assess when lending if borrowers are taking a bad faith modus operandi, so the risk increases. This change in the demand and supply in the financial markets causes interest rates to rise and the supply of funds to decline, resulting in a lower surplus. Short-term tenancy was abolished with the 2003 legal revisions.

7.4.2 Revision of the Minimal Sale Price System

Traditionally, the minimal sale price was set based on the evaluation of real estate appraisers, and if there are no bids at higher prices, such judicial real estate auction was treated as failed. However, the minimal sale price was changed to a standard sale price in the 2004 revision of the Civil Execution Act, and the auction was finalized if there was a price of at least 80% of that amount (minimum purchase price).

The auction result will be an unsuccessful bid if the market value pertaining to the auction property is below the minimal sale price. On the other hand, if the market value is higher than the minimum purchase price, the bidding will be effective, leading to a rise in the bid acceptance ratio, thereby making it easier to recover claims with a judicial real estate auction.

7.4.3 Introduction of Information Provided Through the Internet

The details of properties to be auctioned had traditionally been made public by leaving it to the individual court conducting the auction. But now the provision of information via the internet using the Broadcast Information of Tri-set system[1] has expanded by the 2003 revisions to the Civil Execution Act.

With the introduction of the Broadcast Information of Tri-set system, the cost to auction participants to obtain property information was reduced, and the expectations that buyers who had previously found it difficult to acquire information will be more incentivized to participate will increase the demand for judicial real estate auctions (a shift to the right on the demand curve). Consequently, this will lead to an increase in the highest bids and an increase in the number of bidders for judicial real estate auctions.

7.5 Empirical Analysis of the Impact of System Revisions of Judicial Real Estate Auctions

7.5.1 Hypothesis to be Verified

Based on the hypothesis that the revision of the judicial real estate auction system, reported in Sect. 7.4, contributed to facilitation of judicial real estate auctions bringing about increases of bid acceptance ratio, the increases of the number of bidders as well as of the highest bids for each auction, this paper verified such hypothesis by using data for actual judicial real estate auctions.

7.5.2 Data

This paper uses individual data of actual judicial real estate auctions to build a database combining them, on an auction-by-auction basis, with information on property attributes and sales results obtained from Career-Design Limited, and information mentioned in "Property Specifications", "Report on Survey of Current Status", and "Evaluation Report" obtained from Estate Times Co., Ltd. Note that from the perspective of constraints on data, the data used in this paper refer to auctions undertaken by the central office and each branch office of the Tokyo District Court, Chiba District Court, Yokohama District Court, and the Saitama District Court. For these areas, the analysis was limited to residential condominiums for

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[1] http://bit.sikkou.jp/app/top/pt001/h01/

Table 7.1 Periods for system revisions of judicial real estate auctions

FY	Outline of the system revision
2002	The Broadcast Information of Tri-set system was introduced at the central office of the Tokyo District Court
2004	Abolition of the protection of short-term tenancy
2005	Revision of the minimal sale price system
2006	The Broadcast Information of Tri-set system was introduced at the Tachikawa branch of Tokyo District Court Yokohama District Court (central office and Odawara branch), and whole area of District Court in Chiba and Saitama
2008	The Broadcast Information of Tri-set system was introduced at Yokohama District Court (Kawasaki branch, Yokosuka branch, Sagamihara branch). The Broadcast Information of Tri-set system was introduced at all of the District Court in one metropolitan and three prefectures

which biddings were held in fiscal years FY2001, FY2003, FY2004, FY2005, and FY2009 that were around the times when revisions to the auction system were implemented (the system revision periods are set out in Table 7.1). Note that the dataset was restricted to residential condominiums because the properties indicate a single price for land and buildings and are generally standardized, which made it easier for analysis focused on system revisions.

7.5.3 Estimation Model

Analysis was conducted using the following model. The system revision dummy was indicated by a dummy variable of 1 following revision and 0 before revision. To confirm the effect of the system revision, attention was paid to the result of this variable in each of model (a), model (b), and model (c).

α is a constant term, and ε is an error term. Z is vector and includes control variables that impact on the bid acceptance ratio such as the distance from the nearest station. Note that the control variables[2] are set out in Table 7.2, and the basic statistics are set out in Table 7.3.

(a) Pr (successful bid dummy = 1) = G (α + β system revision dummy + δ'Z)
(b) N (number of bidders) = α + β system revision dummy + δ'Z + ε
(c) lnP (highest bid) = α + β system revision dummy + δ'Z + ε

Model (a) is a Probit model to analyze the impact that system revisions have on the bid acceptance ratio, and function G indicates the distribution function of the standard

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[2]As for variables that control the macro factors in the real estate market, the fiscal year dummy has multicollinearity since system revisions were conducted in terms of fiscal years. So, adopted the cross terms between the distance to the nearest station, which is one property attribute that has a certain impact on the highest bid and bid acceptance ratio, etc. without being impacted by the fiscal year, and the fiscal year dummy as the independent variable.

Table 7.2 Control variables used

Variables	Definition
Distance from the nearest station	Road distance from the nearest station (km)
District Court dummy(Tokyo)	Dummy variable to indicate judicial real estate auctions by District Court (construction site is Tokyo Metropolitan Area) is 1
District Court dummy (Saitama)	Dummy variable to indicate judicial real estate auctions by District Court (construction site is Saitama prefecture) is 1
District Court dummy (Chiba)	Dummy variable to indicate judicial real estate auctions by District Court (construction site is Chiba prefecture) is 1
Exclusive area	Floor space of exclusive elements (m^2)
Balcony dummy	Dummy variable to have a balcony is 1
Total number of households	Total number of households with the condominium
Number of floors	Floor number where exclusive elements are located
Total number of floors	Total number of floors with the condominium
Number of years from construction	The number of years from construction date to bid opening date
SRC (steel framed reinforced concrete) structure dummy	Dummy variable to indicate the condominium which is SRC structure is 1
Arrears of maintenance fee dummy	Dummy variable to indicate where there is arrears of maintenance fee is 1
Short-term tenancy dummy	Dummy variable to set short-term tenancy is 1
Lease dummy	Dummy variable to set right of lease is 1
Third-party occupation dummy	Dummy variable to occupy by the third party is 1
Minimal sale price (minimum purchase price after FY2005)	Minimal sale price (minimum purchase price after FY2005) (10,000 yen)

normal distribution. The dependent variable is the successful bid dummy, and the dummy variable to indicate transactions with a successful bid is 1, while cases of unsuccessful bids are indicated by 0. Analysis was conducted using this model.

Model (b) is a linear regression model to analyze the impact that system revisions have on the number of bidders, and makes estimates using the Ordinary Least Squares (OLS) with the number of bidders as dependent variable.

Model (c) is a linear regression model to analyze the impact that system revisions have on the highest bid. For judicial real estate auctions, since there is a selection bias caused by analysis being limited to data relating to successful bids with data for the highest bid on transactions with unsuccessful bids being dismissed, the estimated amount by OLS lacks consistency. So in this paper, analysis was conducted using the following method.

Heckit Model

This model is a two-stage estimation model that takes a variable that is observable when a latent variable satisfies certain conditions yet unobservable when the

Table 7.3 Basic statistics

Variables	Number of observation	Average	Standard deviation	Minimum value	Maximum value
Successful bid dummy	17,684	0.896290	0.304892	0	1
Number of bidders	17,684	8.294108	8.387802	0	87
ln Highest bid (ln is natural logarithm)	15,850	16.101440	0.738086	12.72784	25.01517
Introduction of Broadcast Information of Tri-set system dummy	17,684	0.453687	0.497865	0	1
Abolition of the protection of short-term tenancy dummy	17,684	0.623332	0.484564	0	1
Revision of minimal sale price system dummy	17,684	0.440851	0.496503	0	1
Distance from the nearest station	17,684	1.226735	1.476636	0.03	18.64
FY 2003 dummy * Distance from the nearest station	17,684	0.242780	0.847284	0	15.36
FY 2004 dummy * Distance from the nearest station	17,684	0.231452	0.834275	0	16.24
FY 2005 dummy * Distance from the nearest station	17,684	0.231587	0.834928	0	18.64
FY 2009 dummy * Distance from the nearest station	17,684	0.276397	0.692386	0	13.5
District Court dummy (Tokyo)	17,684	0.421398	0.493797	0	1
District Court dummy (Saitama)	17,684	0.119996	0.324965	0	1
District Court dummy (Chiba)	17,684	0.159749	0.366383	0	1
Exclusive area	17,684	58.279340	102.012800	5.47	7524
Balcony dummy	17,684	0.968220	0.175419	0	1
Total number of households	17,684	78.179430	111.820200	2	2233
Number of floors	17,684	4.206537	2.990483	1	52
Total number of floors	17,684	7.570233	3.777935	1	56
Number of years from construction	17,684	17.686100	9.450777	0.7150685	110.2658
SRC (steel framed reinforced concrete) structure dummy	17,684	0.285060	0.451456	0	1
Arrears of maintenance fee dummy	17,684	0.759387	0.427468	0	1

(continued)

Table 7.3 (continued)

Variables	Number of observation	Average	Standard deviation	Minimum value	Maximum value
Short-term tenancy dummy	17,684	0.093474	0.291104	0	1
Lease dummy	17,684	0.029405	0.168944	0	1
Third-party occupation dummy	17,684	0.048575	0.214984	0	1
Minimal sale price (minimum purchase price after FY2005)	17,684	791.467000	885.089000	0.8	31,879

condition is not met to be a dependent variable, then conducts an OLS estimate calculating the mills ratio for each sample from the maximum-likelihood estimation results for the Probit model of the auctions with successful bid and unsuccessful bid, adding the estimated inverse number of mills ratio (inverse mills ratio) to the independent variables[3] (Yamamoto 2015).

Switching Regression Model

This is the model[4] adopted by Fukui and Kume (2015b). The first stage is a Probit analysis of auctions with successful bids and unsuccessful bids that estimates the prior bid acceptance ratio for each property based on these results, with an estimate in the second stage by adding this to the independent variables in OLS.

7.5.4   *Estimation Results and Consideration*

Bid Acceptance Ratio

The estimation results in model (a) are presented in Table 7.4. The bid acceptance ratio was at 1% levels with the introduction of the Broadcast Information of Tri-set system and the abolition of the protection of short-term tenancy, and 5% levels with the minimum sales price system revision. Both results were respectively statistically significant increases. The removal of the burden to evict occupants and the ease of acquiring property information are thought to have increased the bid acceptance ratio. In addition, the effect of the revision to the minimal sale price system led to a

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[3]Since the estimate of the parameter dependent on the nonlinearity of the mills ratio is unstable, in practice, it is desirable to add variables that are only included in the first stage. Therefore, the Probit analysis conducted in first stage made its estimates by adding the minimal sale price to the independent variables in the OLS analysis in the second stage.

[4]Adopted also by Fukui and Kume (2015a) and Taguchi and Ide (2004).

Table 7.4 Estimation results (bid acceptance ratio)

	Successful bid dummy		
	Coefficient		Standard error
Introduction of Broadcast Information of Tri-set system dummy	0.029255	***	0.006196
Abolition of the protection of short-term tenancy dummy	0.066619	***	0.008647
Revision of minimal sale price system dummy	0.018516	**	0.008258
Distance from the nearest station	−0.018095	***	0.001915
FY 2003 dummy * Distance from the nearest station	0.005268	**	0.002351
FY 2004 dummy * Distance from the nearest station	0.004448		0.003130
FY 2005 dummy * Distance from the nearest station	0.007213	**	0.003079
FY 2009 dummy * Distance from the nearest station	−0.014541	***	0.003524
District Court dummy(Tokyo)	−0.015163	***	0.005761
District Court dummy(Saitama)	−0.037347	***	0.008235
District Court dummy(Chiba)	0.016751	***	0.005795
Exclusive area	−0.000031	**	0.000014
Balcony dummy	0.056560	***	0.014043
Total number of households	0.000058	***	0.000022
Number of floors	0.000130		0.000986
Total number of floors	0.008565	***	0.001003
Number of years from construction	−0.003219	***	0.000212
SRC (steel framed reinforced concrete) structure dummy	0.017912	***	0.006127
Arrears of maintenance fee dummy	−0.003490		0.004596
Short-term tenancy dummy	0.020653	***	0.005972
Lease dummy	0.013345		0.010503
Third-party occupation dummy	−0.056804	***	0.014436
Minimal sale price (minimum purchase price after FY2005)	−0.000007	***	0.000002
Pseudo R-squared (McFadden)	0.1162		
Number of observation	17,684		

***, **, * means statistically significant at the 1% level, 5% level, and 10% level, respectively

decline in the border amount, which was effective for bidding and is thought to have facilitated successful bidding. If an auction result is an unsuccessful bid, it takes time and effort for the creditor due to the requirement for another auction, etc. Given that many auction practitioners are dissatisfied with the selling period and selling ratio (Cabinet Office 2007), the system revisions appear to have had a certain impact.

Number of Bidders

The estimation results for model (b) are presented in Table 7.5. The number of bidders increased at a statistically significant level of 1% levels for each bidding, with the introduction of the Broadcast Information of Tri-set system and abolition of

Table 7.5 Estimation results (number of bidders)

	Number of bidders		
	Coefficient		Standard error
Introduction of Broadcast Information of Tri-set system dummy	1.903679	***	0.177896
Abolition of the protection of short-term tenancy dummy	2.379518	***	0.210086
Revision of minimal sale price system dummy	0.030601		0.219975
Distance from the nearest station	−0.870920	***	0.071568
FY 2003 dummy * Distance from the nearest station	0.212098	**	0.089188
FY 2004 dummy * Distance from the nearest station	−0.092948		0.109304
FY 2005 dummy * Distance from the nearest station	−0.095886		0.104140
FY 2009 dummy * Distance from the nearest station	−0.394543	***	0.123737
District Court dummy (Tokyo)	−0.618697	***	0.162440
District Court dummy (Saitama)	−1.585154	***	0.196756
District Court dummy (Chiba)	−0.931440	***	0.179811
Exclusive area	−0.001564	***	0.000579
Balcony dummy	1.879682	***	0.326402
Total number of households	0.002243	***	0.000569
Number of floors	0.265480	***	0.024215
Total number of floors	0.322022	***	0.023669
Number of years from construction	−0.181952	***	0.006458
SRC (steel framed reinforced concrete) structure dummy	0.797125	***	0.160113
Arrears of maintenance fee dummy	−0.089958		0.134943
Short-term tenancy dummy	0.728060	***	0.198212
Lease dummy	−0.788224	**	0.337954
Third-party occupation dummy	−1.123583	***	0.278299
Minimal sale price (minimum purchase price after FY2005)	−0.000060		0.000071
Constant term	5.360559	***	0.412418
Adjusted R-squared	0.1955		
Number of observation	17,684		

***, **, * means statistically significant at the 1% level, 5% level, and 10% level, respectively

the protection of short-term tenancy, leading to respective increases of about 1.9 cases and about 2.4 cases.

Highest Bid

The estimation results concerning the highest bid are presented in Table 7.6. Note that the estimate used a robust estimator that accounted for the heteroskedasticity of the disturbance term.

In the Heckit Model, the dummy coefficients for the introduction of the Broadcast Information of Tri-set system, the abolition of the protection of short-term tenancy, and the revision of the minimal sale price system were respectively about 0.281,

Table 7.6 Estimation results (highest bid)

ln Highest bid (ln is natural logarithm)	(1) Heckit Model			(2) Switching Regression Model		
	Coefficient		Standard error	Coefficient		Standard error
Introduction of Broadcast Information of Tri-set system dummy	0.280951	***	0.017291	0.273028	***	0.016854
Abolition of the protection of short-term tenancy dummy	0.225432	***	0.024186	0.203378	***	0.023046
Revision of minimal sale price system dummy	0.053545	***	0.018827	0.044444	**	0.018747
Distance from the nearest station	−0.154464	***	0.012305	−0.150825	***	0.012183
FY 2003 dummy * Distance from the nearest station	0.035478	***	0.010020	0.033011	***	0.009794
FY 2004 dummy * Distance from the nearest station	0.044638	***	0.012183	0.045043	***	0.012152
FY 2005 dummy * Distance from the nearest station	0.079950	***	0.012102	0.080091	***	0.012134
FY 2009 dummy * Distance from the nearest station	−0.115506	***	0.013930	−0.106195	***	0.013883
District Court dummy (Tokyo)	0.171422	***	0.014986	0.179578	***	0.015058
District Court dummy (Saitama)	−0.262486	***	0.016934	−0.249919	***	0.016826
District Court dummy (Chiba)	−0.081872	***	0.018503	−0.086844	***	0.018360
Exclusive area	0.001098		0.000696	0.001099		0.000693
Balcony dummy	0.353136	***	0.039745	0.340767	***	0.039754
Total number of households	0.000216	***	0.000052	0.000238	***	0.000055
Number of floors	0.014581	***	0.002027	0.017180	***	0.002591
Total number of floors	0.055332	***	0.003117	0.047514	***	0.004448
Number of years from construction	−0.038153	***	0.001183	−0.037250	***	0.001103
SRC (steel framed reinforced concrete) structure dummy	0.035914	**	0.015778	0.042056	**	0.017420
Arrears of maintenance fee dummy	−0.119407	***	0.012299	−0.116638	***	0.012275
Short-term tenancy dummy	−0.208982	***	0.019375	−0.216997	***	0.019310
Lease dummy	−0.115840	***	0.033100	−0.117928	***	0.033134
Third-party occupation dummy	−0.232199	***	0.028446	−0.213770	***	0.027922
Inverse mills ratio	2.070307	***	0.169656			
Bid acceptance ratio[a]				−3.104957	***	0.261791

(continued)

Table 7.6 (continued)

ln Highest bid (ln is natural logarithm)	(1) Heckit Model			(2) Switching Regression Model		
	Coefficient		Standard error	Coefficient		Standard error
Constant term	15.434850	***	0.064930	18.667600	***	0.235925
Adjusted R-squared	0.3343			0.3334		
Number of observation	15,850			15,850		

***, **, * means statistically significant at the 1% level, 5% level, and 10% level, respectively
[a]The coefficient for the bid acceptance, which is the independent variables in the switching regression model, is negative. There are three main causes for the high bid acceptance ratio: (1) minimal sale price is low, (2) there are many bidders, and (3) the high bids of bidders. Of these, as the bid acceptance ratio increases, the highest bid also rises for (2) and (3), but in the case that (1) the minimal sale price is low, the bid acceptance ratio increases but the highest bid falls. The estimation results suggest that the cause (1) changes the bid acceptance ratio more than causes (2) and (3). Therefore, the higher the bid acceptance ratio for a property, the lower the highest bid.

0.225, and 0.054, which were all statistically significant at the 1% level for respectively increasing the successful bid price by about 32.4%, 25.3%, and 5.5%.

While there is a difference in the coefficient and significance level under the Switching Regression Model compared to the results from the Heckit Model, the order of impact from the system revision had a similar result.

7.6 Empirical Analysis Concerning the Price Difference for Judicial Real Estate Auctions, Voluntary Sales, and General Real Estate Trading Prices

7.6.1 Background to the Problem and the Hypothesis to be Verified

As described in Sect. 7.5.4.3, the system revision was confirmed to have a positive effect on the highest bid for judicial real estate auctions, and the price difference between judicial real estate auctions, voluntary sales, and general real estate trading is verified based on the hypothesis that "even following the series of system revisions, the price was kept lower than the price of voluntary sales and general real estate trades".

7.6.2 Data

We use the individual data for properties that were sold through judicial real estate auctions, voluntary sales, and general real estate trading from 2012 to 2014 in the Tokyo Metropolitan Area, Chiba Prefecture, Kanagawa Prefecture, and Saitama

Table 7.7 Control variables used

Variables	Definition
Tokyo dummy	Dummy variable to sell in Tokyo Metropolitan Area is 1
Saitama dummy	Dummy variable to sell in Saitama prefecture is 1
Chiba dummy	Dummy variable to sell in Chiba prefecture is 1
CY2013 dummy	Dummy variable to sell in 2013 is 1
CY2014 dummy	Dummy variable to sell in 2014 is 1
Distance from the nearest station	Road distance from the nearest station (km)
Exclusive area	Floor space of exclusive elements (m^2)
SRC (steel framed reinforced concrete) structure dummy	Dummy variable to indicate the condominium which is SRC structure is 1
Total number of floors	Total number of floors with the condominium
Number of floors	Floor number where exclusive elements is located
Number of years from construction	The number of years from construction date to bid opening date
Balcony dummy	Dummy variable to have a balcony is 1
Possessor occupation dummy	Dummy variable to occupy by possessor is 1
Short-term tenancy dummy	Dummy variable to set short-term tenancy is 1
Lease dummy	Dummy variable to set right of lease is 1
Third-party occupation dummy	Dummy variable to occupy by the third party is 1

Prefecture (one metropolitan area and three prefectures). The database was built using the same method as for judicial real estate auctions referred to in Sect. 7.5.2., and data for general real estate trading were obtained from the Real Estate Information Network for East Japan. For voluntary sales, transactions for voluntary sales were identified based on the data acquired from the Japan Housing Finance Agency and matched with the data for general real estate trading. Note that as with Sect. 7.5.2, the property types were limited to residential condominiums to verify the effect focusing on the method of procedures. Note that the control variables are as shown in Table 7.7, and the basic statistics are as shown in Table 7.8.

7.6.3   Estimation Model

A linear regression model is used with estimation through OLS to grasp the difference in the selling price that focuses on property disposal methods for model (d), secular change for model (e), and the state of property occupancy for judicial real estate auctions for model (f). α is a constant term, ε indicates an error term, and ⧄ is vector and includes control variables for the impact on the selling price such as the distance from the nearest station.

(d) $\ln P$ (selling price) $= \alpha + \beta$ auction dummy $+ \gamma$ voluntary sale dummy $+ \delta'⧄ + \varepsilon$
(e) $\ln P$ (selling price) $= \alpha + \beta$ auction dummy $*$ annual dummy $+ \delta'⧄ + \varepsilon$
(f) $\ln P$ (selling price) $= \alpha + \beta$ auction dummy $*$ occupancy state dummy $+ \delta'⧄ + \varepsilon$

Table 7.8 Basic statistics

Variables	Number of observations	Average	Standard deviation	Minimum value	Maximum value
ln selling price (ln is natural logarithm)	106,433	16.790300	0.769939	9.729134	19.70161
Auction dummy	106,433	0.077683	0.267673	0	1
Voluntary sale dummy	106,433	0.058074	0.233885	0	1
Tokyo dummy	106,433	0.483422	0.499727	0	1
Saitama dummy	106,433	0.125581	0.331379	0	1
Chiba dummy	106,433	0.132534	0.339072	0	1
CY2013 dummy	106,433	0.358113	0.479448	0	1
CY2014 dummy	106,433	0.326337	0.468874	0	1
Auction dummy * CY2012 dummy	106,433	0.028318	0.165881	0	1
Auction dummy * CY2013 dummy	106,433	0.028196	0.165534	0	1
Auction dummy * CY2014 dummy	106,433	0.021168	0.143946	0	1
Auction dummy * possessor occupation dummy	106,433	0.057125	0.232083	0	1
Auction dummy * short-term tenancy dummy	106,433	0.000996	0.031543	0	1
Auction dummy * lease dummy	106,433	0.001259	0.035460	0	1
Auction dummy * third-party occupation dummy	106,433	0.018331	0.134145	0	1
Distance from the nearest station	106,433	0.989974	1.207653	0.007	18.4
Exclusive area	106,433	64.231160	21.570810	8.75	492.58
SRC (steel framed reinforced concrete) structure dummy	106,433	0.259910	0.438587	0	1
Total number of floors	106,433	10.082150	7.319233	1	61
Number of floors	106,433	5.549858	5.061002	1	58
Number of years from construction	106,433	19.213800	11.731000	0.1150685	114.7562
Balcony dummy	106,433	0.925437	0.262687	0	1

7.6.4 Estimation Results

The estimation results from models (d) to (f) are presented in Table 7.9. Compared to general real estate trading, the selling price is lower at a 1% level of statistical significance of about 3.8% for voluntary sales and about 37.7% for judicial real estate auctions. In addition, although the price difference between general real estate trading and auctions contracted from 2012 to 2014, the price difference remains large. Note that there was no large difference evident according to differences in the state of occupancy.

Table 7.9 Estimation results (price difference)

	In selling price								
	Coefficient		Standard error	Coefficient		Standard error	Coefficient		Standard error
Auction dummy	−0.377260	***	0.004500						
Voluntary sale dummy	−0.038286	***	0.005120						
Auction dummy * CY2012 dummy				−0.408197	***	0.007424			
Auction dummy * CY2013 dummy				−0.360279	***	0.007392			
Auction dummy * CY2014 dummy				−0.350148	***	0.008456			
Auction dummy * possessor occupation dummy							−0.393672	***	0.005145
Auction dummy * short-term tenancy dummy							−0.365703	***	0.037639
Auction dummy * lease dummy							−0.238460	***	0.033538
Auction dummy * third-party occupation dummy							−0.321731	***	0.008945
Tokyo dummy	0.291637	***	0.002996	0.292554	***	0.002995	0.291585	***	0.002997
Saitama dummy	−0.337090	***	0.004089	−0.336394	***	0.004089	−0.336944	***	0.004089
Chiba dummy	−0.421366	***	0.004038	−0.420500	***	0.004038	−0.420941	***	0.004037
CY2013 dummy	0.034757	***	0.002901	0.031133	***	0.003032	0.035342	***	0.002900
CY2014 dummy	0.093942	***	0.002974	0.090532	***	0.003091	0.095263	***	0.002970
Distance from the nearest station	−0.098307	***	0.001030	−0.098515	***	0.001030	−0.098319	***	0.001030
Exclusive area	0.017652	***	0.000060	0.017656	***	0.000060	0.017706	***	0.000060
SRC (steel framed reinforced concrete) structure dummy	0.054038	***	0.002891	0.053446	***	0.002891	0.053877	***	0.002891
Total number of floors	0.009127	***	0.000259	0.009166	***	0.000259	0.009189	***	0.000259
Number of floors	0.004448	***	0.000354	0.004468	***	0.000354	0.004436	***	0.000354
Number of years from construction	−0.026642	***	0.000117	−0.026690	***	0.000116	−0.026644	***	0.000116
Balcony dummy	0.060969	***	0.004529	0.061053	***	0.004530	0.060810	***	0.004530
Constant term	16.024130	***	0.007293	16.023980	***	0.007302	16.017250	***	0.007289
Adjusted R-squared	0.7475			0.7474			0.7475		
Number of observation	106,433			106,433			106,433		

***, **, * means statistically significant at the 1% level, 5% level, and 10% level, respectively

7.7 Policy Proposals Concerning Revisions of the Court Auction System

Empirical analysis identified that system revisions of the judicial real estate auctions had a positive impact on the bid acceptance ratio, etc. However, this also showed that the price difference remains large compared to general real estate trading and voluntary sales. Here, we project further facilitating of judicial real estate auctions and propose revisions to the judicial real estate auction system taking account of the results of the empirical analysis.

7.7.1 Proposal Concerning the Resolution of Information Asymmetry for Auction Properties

It is important for judicial real estate auctions to resolve the difficulty to ascertain precise value of the property to enable hopeful purchasers to bid according to an evaluation based on personal valuation of the auction property. Empirical analysis identified that the introduction of the Broadcast Information of Tri-set system had a positive impact on the bid acceptance ratio, etc. However, there appears to be scope for further system revisions as set out below.

Expand the Data Listed in the Broadcast Information of Tri-set System

In the Broadcast Information of Tri-set system, it is impossible to acquire a set of three types of information after a certain period has elapsed from the date of the successful bid. In addition, even for analysis of past auction data, the data that can be acquired are limited with only those of the past 3 years are available.

When investigating bidding, in addition to the fact that past successful bid data serve as useful reference, it is easy to acquire such information for general used real estate trades, so it would be best to enhance the data listed in relation to judicial real estate auctions, too, and provide information that is useful for judging bids.

Improving the Preliminary Inspection Procedures

There are restrictions on preliminary inspections of property for judicial real estate auctions. Under the Civil Execution Act, where a petition of the preliminary inspection is filed for the judicial real estate auction by the obligee (creditor) and the title to possession held by the possessor (occupant) may be duly asserted against the obligee affecting a foreclosure, the consent of such possessor is required. In addition, even in terms of the date of the preliminary inspection, the designation by the court following the petition may be inconvenient for the person hoping for a

preliminary inspection, so there are currently very few cases of preliminary inspection (Ministry of Justice: Auction System Study Group 2008). It would be helpful to make it possible to have preliminary inspection on the application of hopeful purchasers as well as designating dates, times, and number of people for preliminary inspection in advance when announcing the auction taking account of the burden on the debtor side. In addition, new postings such as videos for hopeful purchasers that find it difficult to proceed in accordance with the preliminary inspection would also contribute to resolving the information asymmetry.

7.7.2 Proposal for Lower Limit Price for Effective Bidding

As noted in Sect. 7.4.2, bidding above the minimum purchase price is currently effective, but it is conceivable that this could be misused with anti-social occupants that would not place a value above such price that would impede a smooth auction. This system was introduced to prevent the obstruction from pressures exerted by anti-social forces and others under the previous bidding system (auction by hopeful purchasers) (Fukui 2006), but the purpose of its introduction has now been lost now with the introduction of the term bidding system.

As seen in the results of the empirical analysis, the revisions to the minimal sale price system had a positive impact on the bid acceptance ratio and highest bid, so a shift to a reference price system or setting a lower limit price for creditors is thought to contribute to a high successful bid. Consequently, there is scope to introduce a selective system that enables the adoption of a lower limit price system.

7.7.3 Property Handover

Under judicial real estate auctions, the ownership transfer is registered following payment of the proceeds by the purchaser, but the procedures for removing the occupant in the handover of the property must be handled by the purchaser him or herself.[5] Based on the results of the empirical analysis of the abolition of protection of short-term tenancy, revision of the system is needed for the sake of reducing the burden to the purchaser in removing the occupant, and eliminating his or her misgivings about the auction property. For general real estate trading, ownership

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[5]If it is <6 months from a day of the price payment, there is the system of the delivery order that a court of execution can command to deliver auction real estate to the purchaser for the occupant by the statement of purchaser (Civil Execution Act (1979 law 4th) Article 83 Clause 1). It is the procedure that is simpler than normal suit, but the statement of the delivery order is necessary, and advance payment to be necessary for the statement and the compulsory execution when carrying out compulsory execution of delivery after the delivery order decided. So, it is a burden on the purchaser at certain level.

transfer and handover occur at the same time. Given that real estate operators are also involved in the mediation, the handover goes smoothly. Consequently, it is also desirable for judicial real estate auctions that the court implements the confirmation of the state of occupancy following a successful bid and ensures the transfer of ownership to the purchaser and the property handover take place simultaneously to reduce the burden on the purchaser.

In addition, for judicial real estate auction there is no defect liability concerning the quality of the property. In the 2013 interim plan of the Legislative Council (Committee of the Civil Law), there was a proposal to amend the provisions of the Civil Code, and to apply a rule of defect liability in relation to judicial real estate auctions as well (Ministry of Justice: Legislative Council (Committee of the Civil Low (obligation)) The 71st Meeting 2013). However, in the subsequent public comment procedures, there was opposition to the revisions from various quarters (Ministry of Justice: Legislative Council (Committee of the Civil Low (obligation)) The 80th Meeting 2013), saying that, given the imperfections in property information disclosure, the results of auction procedures would be often overruled, etc.; as a result, the implementation of 2017 revisions to the Civil Code has been postponed.[6] Consequently, the introduction of defect liability to judicial real estate auctions should be investigated as a measure to resolve the asymmetry of property information.

7.8 Conclusion

The large price difference between judicial real estate auctions and voluntary sales was identified by empirical analysis, but even if the background to the sale had the same cause being the recovery of a claim, this means the economic value of the property was determined to be lower with a judicial real estate auction. This can also be expressed as stating that the debtor suffered a loss at that point.

There are outstanding issues for the judicial real estate auction system as mentioned in Sect. 7.7, but since this issue can be considered one of the causes for the price difference, a reduction in the price difference should be possible through system revisions that resolve this issue. The ability to sell at a high price through judicial real estate auction creates profit not only for the creditor but also the debtor. In addition, active provision of property information is desirable for purchasers. Furthermore, by reducing the defect risk for creditors and lowering the cost of financing will lead to lower interest rates and increase lending volumes in the financial markets, which stimulates the entire economy.

Since this type of system revision is anticipated to have wide-ranging impact, opinions should be collected from a wide range of persons. Nevertheless, as also

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[6]In Civil Law (1896 law 89th) Article 568 Clause 4 after the revision by the Law (2017 law 44th) to revise a part of the Civil Law, warranty does not arise about the quality of the auction is prescribed.

noted by the Regulatory Reform Council in the Cabinet Office, hearings like those conducted at the Auction System Study Group by the Ministry of Justice tend to have a bias toward the opinions of certain stakeholders, and it will be impossible to obtain a distribution of opinions for all the industries and people related to judicial real estate auctions without an all-encompassing questionnaire survey (Cabinet Office: Regulatory Reform Council 2007). It is also the role of policy makers to make judgment by scrutinizing opinions and to make decisions based on clear reasons of why a matter is considered appropriate, and this should lead to a judicial real estate auction system that is desirable for society as a whole.

7.9 Future Issues

This paper conducted analysis that was restricted to auctions that occurred in 1 metropolitan area and 3 prefectures from the perspective of data constraint, but since judicial real estate auction is a system that has been introduced nationwide in Japan, it would be desirable to conduct analysis that is more precise and covering a wider scope.

In addition, this paper focuses on the price difference looking at difference in the transaction system for the price difference between auctioned properties and general real estate properties, but the price difference is also determined by quality differences and the difference of the potential number of purchasers at the time of the transaction. The analysis in this paper has not been able to distinguish main causes other than the difference in transaction systems, and participants in judicial real estate auction also include operators that plan to on-sell or lend the property so there are questions concerning the ability to compare with the general real estate market. These are limitations of the analysis in this paper.

In addition, in analysis of the impact of auction system revisions, there was an attempt to control the main causes of economic change, but it is possible that they could not be completely controlled. Conducting analysis that compares auction data and general real estate trading data for the same fiscal year would likely be more precise. A future issue will be to conduct more detailed and precise analysis using such data.

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Part II
Real Estate Tax System and Real Estate Market in Japan

Chapter 8
Introduction: Real Estate Tax System and Real Estate Market in Japan

Yoshiro Higano

Abstract This introduction summarizes chapters of Part II. In Chap. 9, Yamamoto (Jpn J Real Estate Sci 31:88–96, 2018) has compared between the street method, the asset valuation adopted for the imposition of property tax in Japan, and the computer-assisted mass appraisal (CAMA) method generally adopted in North America focusing on education and training of valuators. In Chap. 10, Yamazaki (Jpn J Real Estate Sci 31:97–101, 2018) argues that one of the major causes for relatively low density use of land in the city in Japan is the land tax system. He focuses on property tax and examines defects of the tax from view of economist. In Chap. 11, Kobayashi (Jpn J Real Estate Sci 31:129–138, 2018), taking an actual example, has examined difference between precise legal interpretation of 'exemption from real estate acquisition tax due to purpose of use' and taxation practices conducted by local administrative bodies. In Chap. 12, Shirakawa and Okoshi (Jpn J Real Estate Sci 31:88–96, 2017) have shown that the real estate companies were committed to transactions as dual agencies to whatsoever degree, and analyzed attributes of real estate brokerage companies which are able to be dual agencies and how such dual agency affects contract price.

In Chap. 13, Ueno (Jpn J Real Estate Sci 31:97–105, 2017) has analyzed impacts of the macroeconomic conditions on the land price gradient curves which are estimated using real estate data of the Tokyo Metropolitan Area in 1970, 1976, 1985, 1988, 1994, 2008, 2010, and 2016. In Chap. 14, Komatsu (Jpn J Real Estate Sci 31:110–118, 2017) has analyzed impacts that refurbishment of existing apartment has on possible increase in rent using the multinomial probit model and the Tobit model. In Chap. 15, Hanazato (Jpn J Real Estate Sci 31:119–128, 2017) has shown that around 90% of condominium reconstruction cases are predictable using the estimated discriminant function in terms of objective real estate data only. In Chap. 16, Ota et al. (Jpn J Real Estate Sci 31:109–119, 2018) have analyzed determinants of rent for rental house, office, and shop within 10-min walking distance from Shibuya Station in Tokyo. Multiple regression analyses are conducted

Y. Higano (✉)
University of Tsukuba, Tsukuba, Japan
e-mail: higano@jsrsai.jp

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and have shown that space syntax (SS) measures (Hillier and Hanson, The Social Logic of Space. Cambridge University Press, Cambridge, 1984) significantly affect rent as well as conventional location attributes.

8.1   Characteristics of Real Estate Affairs in Japan

The real estate science has evolutionally developed as a unique interdisciplinary and multi-disciplinary science in Japan. One of the research groups has focused on issues of legal systems which prescribe transparency, fairness, taxation, due diligences, etc. in the market. Experts in administrative law, civic law, and/or sociology of law analyze issues caused by the existing land legal systems from a wider view focusing on their social and economic impacts. On the contrary, experts in economics and management science argue that national economic losses are caused by the existing land legal systems, pointing out that such system decreases international competitiveness of the real estate market in Japan. The other group focuses on the determinants of price/rent in the land and housing markets. Experts in the field of civil engineering and urban and regional economics, etc. have tried to identify the mechanism with an eye on improvements in the existing land systems, business model of real estate companies, housing companies, regional and urban planning, real estate information systems, etc. by applying various scientific methods such as hedonic price approach, discriminant analysis, and other statistical and econometrics methods.

Issues of property tax are old and new. In Japan, structure (e.g., house) built on a lot of land is precisely discriminated from the land. Real estate has, therefore, two meanings: structure and land. So, issues of property tax are more complicated and have developed unique analyses in Japan. Property tax is essential revenue source for municipalities, some of which are declining due to low birthrate and longevity. Municipalities are actively responsible for actual practices of property tax irrespective of issues argued by scholars in the abovementioned context.

As the economy has globalized, fairness and transparency of real estate markets have become important topics. Real estate information system such as Land General Information System (or, specifically Real Estate Transaction-price Search) has been prepared and enriched. It is expected that such information system can help buyers and sellers in the real estate market.

Japanese people generally prefer new house to old house. This holds with owned house on a lot of land, owned or rented house in a condominium building, etc. Japan is an earthquake country, and quake-resistance standards of architectures were revised a several times in these five decades. So-called existing non-conformed buildings are still located everywhere in Japan. Existing non-conformed buildings

mean buildings that conformed to the laws at the time when structures were built and do not conform to the current laws and especially many condominium buildings located in large cities like Tokyo, Osaka, etc. are classified into this category. One reason which caused existence of such buildings was the rapid and miracle economic growth with the concentration to large cities during the 1960s and 1970s. Entering the new century, the timing has arrived in which those condominium buildings should be rebuilt. However, due to Act on Building Unit Ownership, most of them are not yet rebuilt. House owners in such condominium buildings have to decide whether they rebuild their houses in a new condominium building, or renovate old one, or destruct old one, etc. while they are constrained with each other when they make decision since the ownership of house in a condominium building is firmly combined with joint ownership of the floor and land pertinent to such a condominium building.

Real estate is asset which becomes target of investment and speculation. Crucial factors for determinants of land price, rent of house on a lot of land, in a condominium building, etc. are important indices for decision with such business. The market of REIT (Real Estate Investment Trust) in Japan, J-REIT, looks prosperous business and transparent and objective indices such as the expected internal rate of return and related risk become more important.

8.2   Issues Related to the Land Legal Systems in Japan

Property tax charged on residential housing is differently charged on both house and land on which house is located as house and land are different ideas of real estate in Japan. Most of the practices of property tax in Japan include the fixed asset (land and house) valuation, especially valuation of land for the imposition of property tax, since value of land is relatively higher than that of house, especially in large cities, and they are conducted by municipality staffs. The asset valuation for the imposition of property tax conforms to the valuation standards promulgated around 60 years ago. The valuation standards are based on the street value method. It is globally unique one.

In Chap. 9, Yamamoto (2018) has compared between the street method, the asset valuation adopted for the imposition of property tax in Japan, and the computer-assisted mass appraisal (CAMA) method generally adopted in North America focusing on education and training of valuators, by examining knowledge, level of skill, and experience necessary for experts in the practice. In reality, most of municipalities have a shortage of experts of the asset valuation in Japan. Resolution may be given cooperation between municipalities and universities, which are officially qualified, for 'training at university (a sort of re-education for once licensed experts)' and active use of real estate appraisers.

Property tax is imposed on office buildings and facilities for production as well in Japan. It is well known that use of land in the city in Japan is relatively low compared to Europe and America. In Chap. 10, Yamazaki (2018) argues that one major cause

for relatively low density use of land in the city is the land tax system in Japan. He focuses on property tax and examines defects of the tax from the view of economist. Abolition of property tax on structures (house, condominium building, office building, apartment, etc.) and facilities for production is proposed because they distort resource allocation in the markets and discourage high density use of land. On the other hand, increase in property tax rate on land is proposed as it is neutral with the resource allocation while unavoidable shortfalls in revenue for municipalities can be made up for by the increase.

The public land purchased by the Incorporated Educational Institution Moritomo Gakuen (abbreviated to Gakuen) had made devastated and idle the diet of Japan for a while. In Chap. 11, Kobayashi (2018) picked up this case as an example and has examined difference between precise legal interpretation of 'exemption from real estate acquisition tax due to purpose of use' and taxation practices conducted by local administrative bodies. He has argued some sort of correction should be made with the gap that is caused by delay between the timing (timing A) in which the acquisition of land was made with the objective of using land for a public interest (this case, elementary school education); therefore, the real estate acquisition tax shall be exempted at this timing (A) following precisely prescription in the law otherwise it shall be charged on this timing (A), and the timing (timing B) in which it became apparent that Gakuen would not use the purchased land for elementary school because of the rescission of establishment approval of elementary school that was made later on and the local administrative body charged land acquisition tax on Gakuen by cancelling the exemption of land acquisition tax once tentatively given at the timing (A) in a practical way.

The law stipulates that the commission for real estate brokers shall be 3% of contract price +60,000 yen for each of selling and buying mediation transactions in Japan. So-called dual agency in the transaction of real estate is strictly regulated in US with each of states' own legislation, and it is not necessarily prohibited in Japan though it is tough for real estate brokers to be faithful and trustable for both of seller and buyer. In Chap. 12, Shirakawa and Okoshi (2017) have shown that, according to the survey by Jutaku-Shimpo, Inc., the average commission level of the ten major residential real estate brokerage companies in 2015 was 4.02%, which has apparently exceeded the upper limit commission level for a single mediation transaction, and it means that the companies were committed to transactions as dual agencies to whatsoever degree. They analyzed attributes of real estate brokerage companies which are able to be dual agencies and how such dual agency affects contract price compared to the case of transaction by single agencies after clarifying quantitatively the status quo of mediation transactions in Japan. Possibility of moral hazard against sellers due to dual agencies is shown since it is statistically significant that the dual agency decreases contract price.

8.3   Characteristics of Real Estate Market in Japan

In 1960s and 1970s, so-called New Urban Economics (NUE) was prosperous in Japan too, being affected by prosperity of the neoclassical economics in the same era. A most popular model is the mono-centric urban model represented by the conventional von Thünen-Alonso-Muth model, in which land (or housing) price is determined decreasingly dependent on the distance to the city center, that is the central business district (CBD). This is the theoretical basis for the distance (geographical or time distance) to the city center to be incorporated into dependent variables with any regression analysis of land price in the city even after the analysis has been drastically improved through adoption of the hedonic approach.

In Chap. 13, Ueno (2017) has examined location attributes such as distance to the city center (Tokyo Station), distance to the nearest railway station, residential area, access to sewerage service, etc., which may affect residential land price in the Tokyo Metropolitan Area, of which distance to Tokyo Station is 50 km or less, by applying the hedonic approach with data in each year of 1970, 1976, 1985, 1988, 1994, 2008, 2010, and 2016. Giving same values for significant attributes except for distance to the city center to normalize selected residential lots, the logarithmic value of residential land price of the selected lots is specified and estimated as a function in distance to the city center for each year. Using graphs (called land price gradient curves) of the estimated functions, impacts that changes in economic conditions such as rapid economic growth, bubble economy and its burst, low bank rate, consumption tax and in social conditions such as population concentration, depopulation, etc. have on changes in the gradient of the curves, vertical and horizontal shifts of the curves, etc. are chronologically analyzed.

Facing the era of aging population combined with the diminishing number of children and low economic growth rate, it is argued that the scale of market for existing house should be increased in order to effectively utilize housing stock accumulated through the era of high economic growth and bubble economy in the 1960s–1980s. However, the share of existing house in the housing market is very low compared to US and Europe, and it fluctuated around 15% recently. One reason is that the rate of refurbished houses is very low, and the rate of existing houses with defect liability insurance is very low in the market. Whether rent can be increased for refurbished apartments is a critical criterion for the decision of owners whether they would make further investment in the refurbishment.

In Chap. 14, Komatsu (2017) has analyzed impacts that refurbishment of existing apartment has on possible increase in rent. Willingness to pay of additional rent for refurbished apartment that is revealed by lessee via questionnaire (called as premium rent) is examined with each of dwelling performances improved by refurbishment works. With the total 18 categories of refurbishment work, premium rent is statistically explicated in terms of attributes of respondent using the multinomial probit model. Using the estimated probit models, a Tobit model is constructed as a Bayes statistic model, and simulation is conducted with actual data of lessee, refurbishment works, and rent for refurbished apartment.

The condominium reconstruction is a social issue in Japan especially in large cities. It has become serious since the probability that a mega-scale earthquake of magnitude 9 class happens in coming several decades is increasing while replacement of existing non-conformed condominium buildings has been little in progress due to a several reasons. It has been highlighted and argued that the ownership of house in a condominium building is firmly combined with joint ownership of the floor and land pertinent to such a condominium building is a critical barrier for the reconstruction because any matter related to the common property pertinent to condominium apartment requires an approval based on a principle of majority decision. The requirement for concluding a resolution of a meeting of co-owners varies from a simple majority through unanimous decision dependent on agenda items, though the requirement has been recently weakened by amendments to related laws. Difficulty to reach a consensus among co-owners is taken as a major barrier for the reconstruction of condominium apartment. However, it is necessary to examine factors which may cause the difficulty in the background in order to enhance the reconstruction actually because just making weak the requirement for concluding a resolution among co-owners may not be sufficient.

In Chap. 15, Hanazato (2017) constructed a hypothesis that the feasibility of condominium reconstruction can be explicated and evaluated in terms of objective real estate data such as 'Increase and Decrease of Volume Ratio before and after reconstruction', 'Total Floor Area before reconstruction', 'Site Area before reconstruction, 'Nearby Land Prices', 'Building Years at Time of Reconstruction', and so on. A discriminant analysis is applied to samples of reconstructed or refurbished condominium buildings, and a discriminant function is estimated. Simulation using the function applied to actual data shows around 90% of reconstruction cases are predictable by using the estimated discriminant function.

Though it is difficult to evaluate location quantitatively, it is an important factor for real estate business as rent and/or price of real estate are critical for investments in such business and they are determined by reflecting characteristics which are associated to location—location attributes. Therefore, it is natural and has a meaning for business purposes to analyze quantified factors which determine rent.

In Chap. 16, Ota et al. (2018) have analyzed determinants of rent using data of rental house, office, and shop within 10-min walking distance from Shibuya Station in Tokyo. Multiple regression analysis is conducted to explain the rent determination. The estimated rent function includes space syntax (SS) measures (Hillier and Hanson 1984) as dependent variables in addition to conventional location attributes. An analytic technique was applied based on SS theory to calculate two measures with the grids of 4 m × 4 m in which the area of road of 4 m width is more than 8 square meters (a half) on a map—(1) 'the visible area' of a grid that is defined as an index representing a sort of visibility of a grid, and is the number of other grids which can be seen from a grid without obstacles and (2) 'the integration value' is an index representing street network centrality, a sort of accessibility to the nearest venue, and is defined as the number of turns on roads which connect two grids with the shortest distance. Results show that both indices of SS affect rent significantly as well as conventionally used location attributes.

8.4   Conclusion

As it is pertinent to the real estate science, any article should have implications in the field of practices. Traditionally, there have been (implicitly or explicitly) battles between practitioners and theorists, especially economist, over the land tax systems in Japan. Above all, arguments with the property tax on real estate are complicated and seem to continue forever since (1) real estate is discriminated into land and structure on the land; (2) property tax on real estate is the major source for the revenue of municipality; and (3) tax practices are conducted by staffs of municipalities of which job positions are not necessarily professionals. Facing the era of depopulation jointly with decreasing birth of children in a several coming decades, the above (2) looks a stubborn barrier for a resolution between the two groups. It is said that tax systems in Japan are relatively more complicated than other countries in Europe and US. Although inclusion of argument by Yamazaki (2018) into a comprehensive discussion including direct taxes such as corporation tax and income tax, indirect taxes such as consumption tax, succession tax, objective taxes such as gasoline tax, etc. should be ideal, suggestion by Yamamoto (2018) may improve premises for leading to a constructive discussion. A huge variety of tax exemption or relief systems are prescribed for taxable objects in relation to 'the public interests' in Japan, and some of them can be double, triple, or even more exemption/relief for a certain objective. Kobayashi (2018) has analyzed a good example which shows critical roles for staffs of taxation practices in order to balance between aims of exemption/relief tax and precise interpretation of law in good or bad sense. Real estate information systems have been prepared with the purpose of making transparent the real estate market especially for buyers and sellers, to whom information is biased and can be blocked otherwise. Shirakawa and Okoshi (2017) have analyzed typical cases in which such information system may work well as designed though there is a space for amendments to existing related laws.

The share of the gross regional product of the Tokyo Metropolitan Area to the GDP is more than one-third. The economy in Japan is heavily dependent on and influenced by that of Tokyo and surrounding areas. As for the trends in the real estate market, this is true, too. Ueno (2017) has shown that, as generally argued and pointed out, the macroeconomic indices some of which are controlled by macroeconomic policies crucially affect the real estate market, and even they may affect the urban spatial structure through the arbitrage in the real estate market.

Expansion of house refurbishment markets is a key for the expansion of the markets of existing house as an important real estate business. Komatsu (2017) has provided useful results for real estate investment business. He has identified effective refurbishment works for rental houses in condominium buildings by identifying premium rent. The replacement of non-conformed existing buildings by new ones which are conformed to current regulations is big issues. Hanazato (2017) has also provided useful and effective information for various policies which enhance reconstruction of houses in a condominium building. The transparency of the real estate market and provision of objective real estate data are essential for any real estate

business and stakeholders, especially in order to call for further investments from abroad. Ota (2018) has been successful to quantify complicated and unique qualitative characteristics which affect the real estate market, e.g., being secluded from the noisy area, adjacent to a main street, etc. by adopting the space syntax theory. This suggests prosperous developments in research by using GIS data and effective utilization for business purposes.

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Chapter 9
Professional Practices in Fixed Assets Valuation and Assessor Education in North America: Suggestions for Japan

Takashi Yamamoto

Abstract This paper examined and compared the situation of and problems with professional practices in fixed assets valuation and assessor education between North America (the United States and Canada) and Japan. Because professional practice in tax assessment takes place within individual municipalities in North America, the opportunities for external experts to participate in the practice are limited. Moreover, external institutions and universities that provide professional education educated the assessors who were in charge of these professional practices. As a result, the costs of professional practices in tax assessment and assessor education and training have been kept low. In Japan, there has been no foundation through which to foster experts within individual municipalities, so much professional practice is outsourced; consequently, this practice has become ineffective and unstable. Thus, Japan can refer to the North American system of providing complete professional tax assessment services within each municipality, as well as the fostering of experts through external organizations.

9.1 Introduction

Regarding fixed assets valuation in Japan, nearly 60 years have passed since the promulgation of valuation standards for fixed assets. The valuation standards are based on the street value method and the process through which valuation standards are developed in Japan differs from that in American and European countries. The fixed assets valuation system in Japan, represented by the street value method, is globally unique. In contrast, fixed assets valuation in North America generally

T. Yamamoto (✉)
Department of Real Estate Sciences, Meikai University, Urayasu, Chiba, Japan

makes full use of computer-assisted mass appraisal (CAMA), a statistical method. Specifically, this method estimates the appraised value of a place after creating an appraisal model based on a large amount of sales comparison data. Thus, the collection of a large amount of sales comparison data is indispensable. The construction of this appraisal model requires large numbers of people who possess sophisticated expertise and sufficient training. Many people who play a core role in the construction of appraisal models in municipalities in North America have undertaken systematic education in real estate science at a graduate school.

This paper examines and compares the situation regarding professional practices in fixed assets valuation and the education of assessors—who are in charge of the practice—between North America (the United States and Canada) and Japan, as well as the associated problems. Finally, this paper provides certain proposals from a realistic perspective in order to address the current problems associated with land tax assessment in Japan.

9.2 Professional Practices

This section compares professional practices in fixed assets valuation between Japan and North America and examines suggestions for professional practice in Japan based on the findings from North America.

9.2.1 Professional Practice in Japan

As mentioned above, the CAMA method has been widely used for mass appraisal in North America; however, it has not been adopted for fixed assets valuation in Japan. Instead, the street value method, shown in Fig. 9.1, has mainly been used. The street value method consists of an operation of analyzing land use zones and areas under similar conditions, an operation of appraising standard residential land,[1] an operation of calculating all street values in neighboring areas under the same conditions based on the street value of a main street and the corresponding value matrix table,[2] and an operation of calculating all lots facing a street based on the corresponding revision rate table.[3] Thus, the street value method is a method of valuating land and is characterized by determining the appraised value of land through multiple step-by-

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[1] A real estate appraiser appraises a standard lot.

[2] The street value of a main street is determined based on the appraised value of standard residential land. All street values in neighboring areas under the same conditions are determined based on indices (obtained when the street value of a main street is set at 100) and the corresponding value matrix table.

[3] For example, the appraised value of a lot with a narrow frontage, a corner lot, etc., is calculated by multiplying the corresponding rate of difference and the street value.

step-1 Classifying land in each municipality into these districts:
(1) commercial districts
(2) residential districts (3) industrial districts

↓

step-2 Subdividing each district into areas having distinguishing characteristics

↓

step-3 Choosing typical land(standard unit) within each of the above areas

↓

step-4 Deriving proper current value of standard units

↓

step-5 Setting the street price of the standard units facing onto the main street

↓

step-6 Setting the street price for each of the other streets

↓

step-7 Deriving proper value of each land

step operational procedures. The advantages of this method are that the progress of these operations can be systematically managed because this method gradually approaches the appraised value of land from a macroscopic perspective to a microscopic perspective, and that the consistency of appraisal can be checked at each operation. As a result, the final accuracy of the appraisal can be increased. The disadvantage of this method is that not only data on each lot but also data on each street must be managed. As a result, data management becomes complicated.

The importance of area analysis is a common point between the CAMA and street value methods. Because the price of real estate is influenced by the area in which it is located, it is necessary to analyze the characteristics of the area and to reflect the analytical results in the appraisal procedure. In the street value method, by calculating the street value using the comparison table, which differs according to the type of land use zone, regionality can be reflected in street value appraisal.

9.2.2 Professional Practices in North America

Construction of an Appraisal Model

The street value method has been adopted in Japan. In North America, an appraisal model has been widely used, particularly for residential appraisal, based on the results obtained by statistically analyzing sales comparison data. The reasons for this may be as follows:

- In North America, because sales comparison data have been sufficiently prepared, many standardized data sets can be obtained. This is because there are research companies to collect and provide sales comparison data; thus, the data are available for a fee.
- In Japan, there are many dead-end and narrow streets, there are many lots, the prices of which must be largely discounted, and the consideration of individuality is highly necessary, so price estimation using a unitary model is not applicable. In North America, since the street conditions of residential areas are generally excellent, stable price estimation is feasible.
- In Japan, there are many odd-shaped, non-road, extremely small-scale parcels, and many lots for which prices must be largely discounted because of their conditions, so specific consideration must be given to appraisal. In North America, the number of residential areas with lot conditions that have serious problems is small, so no large difference occurs in price estimation using an appraisal model.

In Japan, land and buildings are handled as different pieces of real estate and the price of land is generally higher than that of the building. In North America, the land and building are considered as one unit in principle, so the price of the land is added to that of the building for appraisal. Moreover, the price of a building is generally higher than that of the land in North America. Because a building can easily be specified and an explanatory variable can be used, which can be quantified, the price of a building can easily be estimated using an appraisal model. Thus, a method of estimating the price of a residence using an appraisal model has been widely used.

The basic text of the International Association of Assessing Officers (IAAO), which is a professional education organization for assessors, introduces a hybrid model as a standard appraisal model.[4] The hybrid model handles the land and building separately using the following formula, and the appraised value of a residence is obtained by adding the price of the building to that of the land.

(General hybrid model)

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[4]Please refer to p. 121 of Gloudemans (1999), which explains the basic knowledge of mass appraisal.

$$MV = \pi GQ * [(\pi BQ * \Sigma BA) + (\pi LQ * \Sigma LA) + \Sigma OA]$$

MV: Market price
πGQ: Location quotient
πBQ: Coefficient for a building factor
ΣBA: Quantity for a building factor
πLQ: Coefficient for a land factor
ΣLA: Quantity for a land factor
ΣOA: Quantity for another factor

The above-mentioned hybrid model is just a basic form and is amended by municipalities in many cases. This appraisal model seems to be simple at a glance, but the results obtained using this model differ greatly according to the method of extracting price formation factors and the method of determining each coefficient. It is extremely difficult to construct an appropriate model; thus, a certain degree of expertise is required.

The construction of an appraisal model consists of the following operations: (1) a large number of transactions are collected and arranged, (2) a statistical analysis is performed for the collected and arranged transactions, and (3) a model is designed based on the analytical results. SPSS and NCSS,[5] which are commercially available statistical analysis software programs, are often used for these operations. Because certain functions that have been customized for assessors are added to NCSS, it is strongly supported by assessment-related persons from the perspectives of economy and convenience.

Use of the Geographic Information System

Similarly to Japan, the geographic information system (GIS) is an essential tool for fixed assets valuation in North America. The history of using the GIS for fixed assets valuation in North America is longer than that in Japan. In North America, the GIS was diffused, to a certain extent, even in the first half of the 1990s. In Japan, the GIS began to be fully used for professional practice in tax assessment in the second half of the 1990s. At present, there are no major differences in the use of GIS between Japan and North America. Although the basic appraisal method in Japan differs from that in North America, there are many common points between Japan and North America in the use of GIS for the purpose of appraisal. Specifically, the functions of checking and acquiring appraisal data are often used in Japan and North America. For example, a method of analyzing abnormal values in appraisal data using the thematic map function is frequently used in both Japan and North America. However, there is a difference between Japan and North America. In North America, since the response surface analysis method is frequently used to complement sales comparison data, a high-precision location analysis becomes feasible. One of the

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[5]For the details, please refer to https://www.ncss.com/industries/mass-appraisal/

Table 9.1 Target values of
COD and PRD in areas for
stand-alone houses

Category	COD	PRD
Newly developed area	10 or lower	0.98–1.03
Residential area	15 or lower	0.98–1.03
Farmhouse area	20 or lower	0.98–1.03

Note: This table was created based on IAAO (1999)

characteristics of appraisal practices in North America is that data obtained using a response surface analysis are reflected in the appraisal model.

SPSS and NCSS are recognized as standard statistical analysis software programs for the construction of appraisal models. In contrast, there is no standard GIS software program.

Ratio Studies

In North America, ratio studies related to indices have been widely used to secure the reliability of appraisal models.[6] A ratio study is a method of verification, in which multiple indices are obtained by performing a statistical analysis based mainly on a value obtained by dividing the ratable value of property by the price of a transaction, and the reliability of an appraisal model is estimated based on the obtained indices.

The price-related differential (PRD) and coefficient of dispersion (COD) are particularly important indices in ratio studies. These indices are calculated as follows:

$$\text{PRD} = [\text{average value of } (A/S)]/[(\text{average value of } A)/(\text{average value of } S)]$$

A: Ratable value, S: Price of a transaction.

As shown in this formula, when the value of PRD is closer to 1, the relationship between the ratable value and the price of a transaction is presumed to be more stable.

COD is defined by the following formula:

$$\text{COD} = [\text{mean deviation of } 100 * (A/S)]/[\text{mean value of } (A/S)]$$

When the value of the COD is large, the dispersion of "ratable value/price of a transaction" is also large. In this case, there is room for improvement on the corresponding appraisal model. Thus, in the ratio studies, indices such as PRD and COD are calculated together with the construction of an appraisal model. Ratio studies have been used to provide back data that are used to verify the accuracy of an appraisal model from multiple perspectives. As shown in Table 9.1, the IAAO provides the desirable target values of these indices.

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[6]For example, IAAO (1999) describes IAAO's dictum on the ratio studies.

Assessors must always pay attention to these values when constructing an appraisal model. An appraisal model must be constructed so that various indices related to the ratio studies have excellent values. Actually, NCSS automatically calculates various indices.

These values are also used as assessors' performance indices in order to raise their motivation in professional practices. When municipalities disclose information to their taxpayers, these values are sometimes used as explanatory materials to secure the corresponding appraisal.

"Cruces of practices" for North American-Type Mass Appraisal

The common understanding of assessors is that an excellent appraisal model must satisfy the following four requirements: accuracy, rationality, explainability, and frugality. Japanese appraisal practitioners also emphasize that accuracy, rationality, and explainability are essential. Frugality indicates that a carelessly complicated model is undesirable. If a model with high universality is oriented, a frugal model will be constructed.

1. *Handling of outliers in sales comparison data*

    When a statistical analysis is performed using transactions, it is risky to blindly use all data sets. In cases in which the number of samples is small, the analytical results will be highly biased if the data contain outliers. Thus, the collected sales comparison data must be critically examined. Although such a topical idea is understandable, the handling of outliers in individual cases requires delicate prudence. To analyze sales comparison data, it is at least necessary to obtain basic statistics, to create a scatter diagram from multiple perspectives, and to perform a visual examination.

2. *Time adjustment analysis based on economic theory*

    The changes in real estate prices in residential areas in North America are more complicated than those in Japan due to the effects of various factors, including seasonal variation and periodicity. Thus, in the operation of time adjustment, it is risky and non-persuasive to simply adopt experience points based on changes in real estate prices in the past. In professional practice in North America, a method developed by referring to the idea of a time-series analysis in the field of econometrics is incorporated into the time adjustment analysis method.

3. *Location analysis organically connected to GIS*

    The formation of housing prices is not simple, even in North America, and a highly-explainable appraisal model cannot be constructed based solely on site and building factors, which can be quantitatively understood. To raise the precision of an appraisal model, an idea to reflect the locational characteristics of each house in the model is extremely necessary, as indicated by the location quotient in the above-mentioned hybrid model. GIS is used to acquire data related to the locational characteristics and the locational characteristics can be obtained by three-dimensionally analyzing the distribution of housing prices in sales

comparison data. This three-dimensional analysis is exactly the above-mentioned response surface analysis, the use of which is one of the characteristics of mass appraisal in North America. Based on a study of Hirayama, et al. (2006, p. 59), the procedure of this analysis is explained as follows:

(a) A regression analysis is performed based on land transactions without considering the location of the property.
(b) Using the regression equation obtained by the analysis, the average value of the predicted land prices corresponding to the transaction is obtained.
(c) By dividing the sale price of each transaction by the obtained average value, a relative price is obtained. The locational condition is considered to be better or worse as the relative price becomes higher or lower (than 1), respectively.
(d) Values corresponding to the x and y axes are given to the location of each transaction. x and y values are also allocated to taxable real estate other than the transactions.
(e) The relative price of each transaction obtained c. above is defined as the z value, and the x, y, and z values are input into a software program that can draw contour lines.

When these contour lines are three-dimensionally expressed, a sequential curved surface is obtained. This is the reason why the above-mentioned three-dimensional analysis is called a response surface analysis. The value corresponding to the height of this curved surface (namely, the z value) is considered as a locational factor, and this factor is added to the appraisal model (the construction of the appraisal model is completed). Thus, GIS plays a complementary role in the general appraisal practice in Japan. In North America, GIS is closely related to the appraisal practice and plays an important role in the appraisal process. This is noteworthy.

4. *Roles of ratio studies*

Ratio studies play multiple roles. First, they act as a tool to manage the accuracy of mass appraisal practices. In North America, the ratio studies are expected to improve the accuracy of the appraised value of a place by repeatedly constructing appraisal models and providing feedback, similar to the street value method in Japan. Thus, the ratio studies are used as an accurate baseline for mass appraisal. Second, ratio studies play a role as a performance index for assessors. As mentioned above, the role of each officer in a department that performs fixed assets valuation in a municipality is clearly determined. In municipalities, high positions are given to assessors who are experts in the construction of appraisal models. In the evaluation and treatment of an assessor, the results of ratio studies are probably taken into consideration. In North America, assessors often change their place of employment to other municipalities or private consulting firms. The results of ratio studies in the construction of appraisal models are sometimes used to prove the assessor's capability. Third, ratio studies play a role in the implementation of accountability to taxpayers. In North America, the disclosure of information on fixed assets valuation has a good reputation in its historical accumulation and substantial content. In the implementation of accountability

to taxpayers in relation to tax assessment, the results of ratio studies are sometimes used as supporting data. In a certain state, detailed reports on ratio studies are disclosed to obtain taxpayers' understanding.[7]

9.2.3   Suggestions for Japan

Appraisal practices in Japan can refer to the points described below. The first point is the attitude towards attaching weight to the analysis of the real estate market. Mass appraisal in North America gives the impression that it begins with the analysis of transactions and ends with the analysis of transactions, and a lot of time is expended in the analysis of the real estate market. When constructing an appraisal model, a large number of transactions are analyzed from a multidirectional perspective. This is because real estate markets in North America are inhomogeneous, and market trends differ according to cities and regions. The time expended in the analysis of transactions in Japan is considered to be shorter than that in North America. In Japan, after the collapse of the real estate bubble, land prices uniformly declined for a long time. Recently, however, conspicuous upward trends in land prices have been observed in certain cities and regions. In the recent reappraisal of fixed assets, areas where land prices showed upward trends and areas where land prices continuously declined coexisted in many municipalities. Thus, the results of real estate market analyses, which have been carefully performed, become indispensable for providing an explanation to taxpayers.

The second point is the existence of a mechanism to systematically verify the reliability of fixed assets valuation represented by ratio studies. As mentioned above, in North America, ratio studies have been firmly established as a system to raise the reliability of fixed assets valuation. It is noteworthy that due to this system, appropriate competition among assessors and municipalities and a feeling of tension have been maintained. In Japan, there is no firmly established index to specifically measure the reliability of fixed assets valuation. In the future, it is predicted that in professional practice in tax assessment in Japan, improvement in the accuracy of appraisal and the provision of a convincing explanation to taxpayers will be more important than ever before. To cope with this, the possibility of introducing a system similar to ratio studies in North America should be examined.

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[7]For example, in the State of Washington, the results of ratio studies in each county are summarized and published in the form of a report.

9.3   Fixed Assets Valuation and Assessor Education Systems

This section compares fixed assets valuation and assessor education systems between Japan and North America and examines suggestions for appraisal practices in Japan based on knowledge obtained in North America.

9.3.1   Fixed Assets Valuation and Assessor Education Systems in Japan

Tax assessment in municipalities in Japan is systematically and technologically supported by the Ministry of Internal Affairs and Communications. Therefore, no large differences exist in tax assessment among municipalities. The Research Center for Property Assessment System periodically provides opportunities for staff training so that the staff of each municipality can acquire basic knowledge on tax assessment.

As the characteristics of the fixed assets valuation system in Japan's municipalities, "job rotation" and a "system of outsourcing to appraisal consultants" can be cited. "Job rotation" and a "system of outsourcing to appraisal consultants" are explained below.

1. *Job rotation*

   Job rotation is performed very often in municipalities. For example, the staff of a municipality is assigned to the fixed property tax division from other divisions and from the fixed property tax division to other divisions after approximately 3 years have passed. Thus, it is difficult to foster a staff with sufficient expertise and experience in appraisal practices. Recently, the streamlining of duties, including staff cutbacks, has advanced, and this trend has been clearly noticed.

2. *The system of outsourcing to appraisal consulting firms*

   To solve the above-mentioned problem, many municipalities entrust tax assessment to appraisal consulting firms, including aerial survey companies and real estate appraisal companies (outsourcing of appraisal practices). If a particular appraisal consulting firm is in charge of tax assessment for a long time, the consulting firm can accumulate experience in appraisal practices. As a result, the accuracy and stability of appraisal can be improved. However, if a municipality provides long-term private contracts for tax assessment, the cost of outsourcing will be huge.

   To avoid this, municipalities select appraisal consulting firms using a competitive bidding process. This increases the possibility that appraisal consulting firms will be periodically changed. If consulting firms are changed, there is a high risk that the new consulting firm will not take over the accumulated knowledge and data. As a result, appraisal may be unstable. When an officer in a municipality

who is in charge of tax assessment is not capable of controlling the corresponding consulting firm, inconvenience may occur.

The above-mentioned matters can be summarized as follows: (a) due to job rotation in municipalities, appraisal experts cannot be stably fostered; (b) many municipalities must entrust appraisal practices to external experts; (c) because a competitive bidding process has been recommended in the consignment of tax assessment in recent years, appraisal consulting firms may be changed every 3 years at the time of reappraisal of fixed assets; and (d) appraisal may become unstable. Thus, knowledge on appraisal is not sufficiently accumulated in municipalities. Therefore, it is difficult for staff members with only a few years of experience in tax assessment to consistently explain tax assessment to taxpayers based on the accumulation of past appraisals.

9.3.2 Fixed Assets Valuation and Assessor Education Systems in North America

The scales of municipalities vary widely in North America so the organizations in charge of fixed assets valuation in municipalities cannot be simply explained. The differences between North America and Japan are as follows: (1) the absolute number of municipal officers in charge of appraisal is larger in North America, (2) role sharing is more advanced in North America, and (3) some municipal officers are treated as experts in North America. For example, in a municipality with a population of approximately 30,000, there will be around 50 officers in charge of appraisal. Role sharing is advanced so that municipal officers are classified as officers in charge of GIS, those in charge of the construction of an appraisal model, those in charge of field surveys, etc. Assessors who are mainly responsible for the construction of appraisal models are treated as experts, and are not assigned to other divisions. However, assessors often change their place of employment to other municipalities or private consulting firms.

In Japan, the municipal officers in charge of tax assessment are requested to acquire necessary skills by accumulating actual practice at their workplaces. In the United States, a private organization specialized in assessor education plays an important role.

This organization, the IAAO, is described in Sect. 9.2.2.1 above. The IAAO lays the foundation for training assessors in municipalities in North America. Municipal officers who want to be assessors in North America are asked to undertake training courses sponsored by the IAAO and to earn necessary credits. After earning certain credits, these officers take an examination to obtain a qualification authorized by the IAAO. When these officers pass the examination, the qualification is given to them. The experts' roles and positions in municipalities are according to the qualifications that they have obtained.

Table 9.2 Assessor qualifications authorized by the IAAO

Qualifications	Roles and contents
Certified assessment evaluator (CAE)	The role of a CAE is to supervise all professional practice in tax assessment. CAE is ranked as the highest qualification among the qualifications authorized by the IAAO
Residential evaluation specialist (RES)	An RES is a specialist in the tax assessment of residences
Mass appraisal specialist (MAS)	An MAS is a specialist who has systematically acquired specialty knowledge on mass appraisal technology (data analysis and appraisal model construction)
Assessment administration specialist (AAS)	An AAS is a specialist who is responsible for the administrative management of general property tax
Personal property specialist (PPS)	A PPS is a specialist in the tax assessment of movable property
Cadastral mapping specialist (CMS	A CMS is a specialist in cadastral mapping

At present, the IAAO authorizes six qualifications (Table 9.2). Each qualification corresponds to a specific field of professional practice. Among the six qualifications, certified assessment evaluator (CAE) is ranked as the highest qualification. CAEs are in charge of supervising all professional practice in tax assessment; the immediate goal of many assessors is to obtain this certification.

A point worthy of special mention is that the University of British Columbia in Canada fosters assessors in its graduate school (business school) in cooperation with the IAAO.[8] Due to its effect, the number of assessors who have IAAO qualifications has tended to increase in Canadian municipalities. The IAAO periodically holds research conferences in addition to assessor training.[9] As a result, appraisal technology has improved, the results obtained by the improved technology have been shared among the IAAO's members, and knowledge on appraisal has been steadily accumulated.

9.3.3 Suggestions for Japan

As mentioned above, in North America, because professional practices in tax assessment are completed within a municipality, external experts do not have many opportunities to participate. Moreover, external professional education

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[8]Please refer to http://www.sauder.ubc.ca/Programs/Real_Estate_Division/Credit_Programs_and_Professional_Development_Courses

[9]Research conferences with several thousand participants are periodically held in major cities in North America. There are dozens of subcommittees, in which the results of studies in almost all fields of fixed assets valuation are presented and discussed. Approximately 90% of participants are assessors in North America, and some participants come from developing countries.

institutions and universities positively undertake the education of assessors who are in charge of these professional practices. As a result, the costs of professional practices in tax assessment and assessor education and training are kept low. In Japan, there is no foundation through which to foster experts within each municipality, so many professional practices are outsourced; consequently, these practices become ineffective and unstable. Moreover, assessors seldom cooperate and liaise with special organizations, such as universities. To improve this, Japan can refer to the North American system of completing the professional practice in tax assessment within each municipality, as well as the fostering of experts through external organizations.

9.4 Certain Proposals

As mentioned above, the number of highly-specialized persons who can supervise all professional practices in tax assessment in the tax assessment divisions of Japanese municipalities has become insufficient. As a result, various problems occur. To solve this, we propose that the tax assessment division in municipalities should foster individuals who wish to become qualified real estate appraisers, whose positions as specialists in real estate appraisal have been established. In addition to improving the accuracy and efficiency of appraisal practices in municipalities,[10] this will improve the reliability of tax assessment and facilitate the easy collection of taxes from taxpayers. Finally, definite plans are described below in the summary of this paper.

9.4.1 Fostering Assessors in Municipalities in Cooperation with Universities

In Japan, real estate appraisers play a central role in real estate appraisal as national qualification holders. However, after passing the national examination, prospective real estate appraisers must pass a final test after receiving practical training for a certain period of time. These individuals generally receive practical training while working for real estate appraisal companies. Thus, it is difficult for municipal officers to become qualified real estate appraisers. There is a system called "training at university." In this system, a university, which has been authorized as a practical

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[10]The municipal officers in charge of appraisal are in daily contact with real estate appraisers who are responsible for standard residential land appraisal and for consulting practices in each stage of street value appraisal. To manage the accuracy of the professional practice of external real estate appraisers, these officers, as qualified persons, are requested to have knowledge on real estate appraisal that is equal to or greater than that of external real estate appraisers.

training institution, performs "practical exercises" for practical training. The practical exercises are generally performed outside office workers' working hours. In this case, municipal officers can obtain a real estate appraiser qualification while working for a municipality. By progressively using this system, the number of appraisal specialists in municipalities can be increased.

Meikai University, which is the only university in Japan with a department of real estate (Department of Real Estate Sciences), has also received authorization for "training at university." Meikai University Graduate School of Real Estate Sciences offers various courses, including real estate appraisal, architecture, GIS, statistical analysis, real estate-related laws, real estate-related policies, and real estate accounting. Thus, this graduate school can provide education services in conformity with the IAAO's education and training. In the past, Meikai University accepted a few municipal officers who were in charge of fixed assets valuation. In this case, however, the school expenses were self-paid, the acquisition of the real estate appraiser qualification was categorized as "personal self-development," and no differences were observed in their occupational roles or treatment after acquiring the qualification. If the school expenses are paid by municipal officers who have passed the essay-based examination for real estate appraisers are fully or partially assisted by public expenses, they can receive "training at university." If the personnel treatment system is amended so that municipal officers are ranked as highly skilled professionals after obtaining the qualification, the number of municipal officers who want to be real estate appraisers will increase. Moreover, if municipal officers receive real estate science education at a graduate school together with "training at university," the effect of the training will increase.

9.4.2 Employment of Real Estate Appraisers by Municipalities

The number of specialists in real estate appraisal in municipalities can be increased by newly employing real estate appraisers. Although this method increases personnel costs, the personnel costs can be reduced by employing part-time officers. For example, real estate appraisers who have experienced consulting practices in fixed assets valuation in major real estate appraisal companies can be expected as work-ready persons because they are familiar with practical operations related to the standards for real estate appraisal and the valuation standards for fixed assets.

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Chapter 10
The Optimal Reform About Property Tax

Fukuju Yamazaki

Abstract We present the desirable tax reform on the property tax on land and housing in Japan. Since the property tax on housing, building, and equipment becomes an obstacle to the capital formation on land, it should be abolished. Conversely, the effective rate of property tax on land should be increased so as to attain the revenue neutrality for local government. The abolition of tax on housing induces the higher land price which can bear the increase in the property tax on land, so that such a tax reform would benefit all individuals.

Keywords Property tax on land and housing · Revenue neutral

10.1 Introduction

The government and ruling parties have recently drafted a large package of changes to the tax system. This includes increasing tax on high-income earners, while reducing property tax. Reducing tax on fixed properties is particularly important for facilities owned by small-to-medium enterprises. It is necessary to improve the productivity of workers to deal with labor shortages in the future, and economize on labor to embrace new technology in the form of robots and AI (Aritificial Intelligence).

Taxes on machinery and equipment inhibit the introduction of new technology and can curb investment, which is why a reduction on property tax has been incorporated into the package. Traditionally, economists have taken the disapproving stance, claiming that property taxes on investments in equipment and buildings are not undesirable. In that sense, the incorporation of property tax reduction into the package requires further evaluation.

F. Yamazaki (✉)
Kyoritsu Women's University, Tokyo, Japan
e-mail: fyamazaki@kyoritsu-wu.ac.jp

Accepting that property taxes are indispensable financial sources for the local government, taxes should be placed on land ownership rather than housing and equipment. A fixed tax rate on things, such as land of which supplies do not change depending on price, is ideal because it does not affect resource allocation.

From the perspective of the effective use of land and fair distribution of income, after listing the issues and challenges for property tax in Japan, this paper proposes abolishing property tax on housing and raising property tax rate on land to compensate for the financial deficiency of the local government. Also, the miniaturization of and utilization should be prevented by abolishing the special measure of property tax on small-scale residential plots.

Property tax is an important funding source for local governments in rural areas. Therefore, local governments may strongly oppose the abolishment of property taxes on housing. To overcome this opposition, revenue-neutral tax system reforms should be considered. To this end, I would like to propose raising the effective tax rate of property tax on land.

Alleviating or abolishing tax on housing will promote multi-storied or shared usage, which will increase the demand for land and raise land prices. This increase in land prices may raise the tax capacity of land owners. Thus, politically, it is easy to raise tax on land, which will cover the reduction in tax revenues for prefectures and towns due to the abolishment of property tax on housing. Therefore, opposition from local governments can be restrained. Furthermore, the effect of reducing tax on housing will limit any decrease in land pricing due to raising the property tax rate on land, which is also preferable for land owners.

10.2   Regulation and Taxation System: Causes of Low-Density Land Utilization

10.2.1   Regulations and Inheritance Tax

One of the issues in Japanese cities has been the low-density use of land. Despite the high price of land in shopping areas near stations, these areas comprise shuttered streets rather than multi-story buildings, and land is only developed to a low level. Urban bay areas are lined with multi-story apartment buildings, but in the suburbs of Tokyo, agricultural land is still found and the number of vacant plots is increasing. In this manner, the existence of shuttered streets in shopping areas near stations in city centers and vacant plots and housing in the suburbs results in the ineffective use of land.

The prevention of high-density use of land is caused by land use regulations and land legislation. In general, most land use regulations have been introduced from the perspective of preventing congestion and amending over-concentration. They were introduced with the objectives of preventing excessive burden on urban

infrastructures by means of floor area regulations, and they include regulations on the purpose of use, floor space index regulations, and height restrictions.

However, congestion in urban roads and railways does not seem to have been mitigated despite these measures. Even if there has been some mitigation of congestion, it has produced much more serious side effects. The effective use of land has also been hindered by legal issues. It appears that the Act on Land and Building Leases and the Act on Building Unit Ownership have reduced the supply of rental housing and condominiums.

In addition to these regulations and legal issues, the land tax system has distorted the effective use of land. Therein, the influence of inheritance tax and property tax cannot be ignored.

Inheritance tax, which is a tax on the inheritance of land, can be viewed as taking away profits from landowners who are wealthy individuals. Therefore, while it is generally thought that strengthening inheritance tax would contribute to the fair distribution of income, the current inheritance tax by no means contributes to fair distribution. Rather, it is profitable to a considerable number of land and house owners, and it causes an increase in land prices. Land is more beneficial than financial assets in terms of the inheritance tax system, which is why land is a superior means of handing down assets.

With the current inheritance tax system, even if the land owner has no means of effectively using the land, he or she will not sell it, which makes the land use unchanged in the long term, and the land and land use is fixed as a property of current landowner. This causes land prices to rise and additionally makes unchanged the structure of cities and inhibits joint use and high-density use of land.

Inheritance tax is, thus, the reason why shopping streets in front of stations become 'shutter- streets' in which all storefronts are closed for business and the continued existence of huge areas of agricultural land in the suburbs. Furthermore, it is the cause of vacant housing. Inheritance tax raises land prices, which results in an incredibly unfair distribution of income between individuals who own land and people who do not.

Fixed property tax distorts efficient land use in the same way as inheritance tax and produces injustice in distribution. Hereafter, with a focus on fixed property tax, I will propose necessary reforms to the tax system to ensure effective use of land.

10.3   Property Tax on Land and Housing

10.3.1   Property Tax on Land

In general, property tax that is charged on land ownership should be an ideal as it is neutral with regard to resource allocation.

The supply of land as goods is limited. For example, except for reclamation, the land area in the wards of Tokyo is limited. If land owners are taxed, there will be no

change to the use of land, and if the land is sold, the new landowner will be taxed. Landowners who do not use the land in order to maximize profits just accept losses.

It is one of classical theses of Economics that it is desirable to tax assets of which supply does not change regardless of price. It is desirable to charge tax of fixed ratio on goods such as land of which supply does not change irrespective of price as the tax will not affect the allocation of resource; here resource allocation refers to land use.

10.3.2 Property Tax on Housing

Facilities such as buildings and machinery as well as land are charged fixed property tax and city planning tax. While the supply of land fixed, this is not the case for the supply of buildings, such as houses and offices or mechanical equipment; It can be increased or decreased depending on changes in the market environment. A rise in housing prices increases housing supply and demand. A rise in office rent and building prices gives further incentive for developers to promote the development of commercial buildings.

Therefore, taxation on owners of housing and offices, that is, property tax on buildings, reduces the profitability of such buildings, which results in a negative influence on high-density use of land. In other words, property tax on resources other than land is disadvantageous to housing and office ownership, thereby reducing the demand for buildings and resulting in decreased floor area.

Based on the earlier example, even if land prices change, the land area of the wards of Tokyo does not change, but if land price and rent increase, buildings will be replaced by multi-storied buildings in order to increase the floor area with a limited area of land. The area of land cannot be changed, but the floor area can be changed. By in-vesting funds in the construction of the construction of multi-story buildings, a larger floor area can be obtained with a limited area of land. This leads to economization of land that has a high land price. In contrast, imposing a tax on building ownership is disadvantageous to investing in buildings, and it limits the effective use of land. Therefore, fixed property tax on housing and offices inhibits the shared and high-level use of buildings, which is not optimal.

As property tax of fixed tax ratio will be charged on floor area of buildings, a larger amount of fixed property tax must be paid by making solid construction of more shared and higher-storied buildings. This reduces the supply of housing, which hinders the promotion of multi-story buildings and earthquake resistance. The side effects of such property tax on buildings are a delay in the improvement of houses to make them highly earthquake resistant and energy efficient and to the reconstruction of old, dangerous housing. As a special exception to prevent this side effect, fixed property tax reduction measures are in place for newly constructed housing, good quality housing with a floor area of up to 120 m^2, and earthquake-resistant buildings. However, if there is recognition of this side effect, fixed property tax on buildings should be abolished in any case.

10.3.3 The Benefit Principle

Furthermore, property tax on buildings is not compatible with the benefit principle. The benefit principle is that when the government supplies public goods by using revenue of tax, those who benefit from the supply of public goods must pay for the tax. Essentially, it is a value judgment that those who benefit from the services provided by the government should bear the cost of this through taxation.

Most public services are regionally supplied, and public goods that are equally profitable for all citizens nationwide are almost non-existent, except for national defense services. Other than this, it is difficult to find textbook examples that allow for 'non-competitiveness and non-excludability in consumption.' The goods and services supplied by the government are essentially regional goods, and they cannot be consumed without living in that region. Roads and parks are region specific, as are firefighting and police services, and it is extremely unlikely that a person will consume the road and park service in a region far removed from his or her residence. In general, as the distance from one's residence increases, the frequency of consumption of such services decreases.

As a result, the value of services inherent in a region is reflected in the land prices of that region. An example of the operation of this mechanism can be seen with an increase in land prices when a station is built. This is because commuting to the city center becomes easier. Unless one lives in the region, public services, such as railroads and stations, are meaningless and entirely regional. It is the same for parks, roads, and security. Therefore, the benefits from public services in rural areas supplied by the national and local governments are primarily reflected in land prices. Hence, from the perspective of the benefit principle, the cost of public services should be placed on land owners.

The value of public and administrative services is reflected in the land prices of that region, so the purpose of imposing property tax and city planning tax on land is to collect compensation from landowners for public services as it is difficult to directly charge us-age fee on the benefiters by public services. Local governments that provide excellent public services for free or at a low cost will attract more residents, which will result in higher land prices. The benefit principle is adhered to when the burden for public service costs is placed on land owners by charging tax on land thus having higher land prices.

Therefore, taxing land is compatible with the benefit principle. However, the price of buildings, including housing, is influenced by construction costs, but it is rarely influenced by the quality and standard of public services. The price of a building that does not include land is mostly determined by the cost of construction.

10.3.4 Property Tax That Enhances Small-Scale Land Ownership

Although it has been stated that property tax on land is desirable in terms of resource allocation and income distribution, in reality, there are various special exceptions and measures for adjusting the burden of fixed property tax in Japan, which can distort the optimality.

The current property tax rate is 1.4%, the city planning tax is 0.3%, and the tax base amount when levying taxes is roughly 70% of the disclosed land price. For small-scale housing sites, various favorable measures in the tax system exist. There are special exceptions for fixed property tax evaluations on housing sites with an area of up to 200 m^2 that reduce the tax base amount by five-sixths and the city planning tax by half. This is an incentive for owning residential land having area of 200 m^2 or less.

It is difficult to assemble lands of small-scale ownership. In order to develop condominium buildings and office sites in city centers, it is necessary to consolidate small-scale land ownership. When land ownership is miniaturized, it is necessary to hold purchasing negotiations and the settlement of interests with more land rights holders. As a result, great expense and time is required for negotiations when land ownership is miniaturized and land rights holders increase even for the same scale of development. Roppongi Hills was developed over several decades, but most of this time was taken up with these kinds of negotiations and contracts.

The frequency and cost of such negotiations increase in excess of what is proportionate to the miniaturization of the land ownership. Therefore, to save social costs required for future developments and conversion, the tax system should not miniaturize land ownership. Furthermore, special systems for small-scale residential plots that promote such miniaturization of land ownership should be abolished.

Naturally, the scale of land use differs depending on the purpose of its use, and housing differs depending on the scale of the family. There are offices and factories that require major land or floor areas, but offices and individual-use housing exist for which relatively small-scale land use is sufficient. Regarding such land and floor area uses of different scales, the social cost will be lower if dealt with through rental agreements for the land used rather than through division of land ownership.

The consolidation of land ownership rights requires even more money than simply multiplying the per-person cost of negotiations and contracts by the number of land owners. Consequently, if no incentive is given by the tax system for the miniaturization of land ownership, even under market mechanisms, land ownership will be kept to an optimal level.

Nevertheless, it does not seem feasible that a great deal of land should be consolidated under a single owner. The vertically integrated use of land starting from a land owner has a greater economizing effect than rental agreements on the costs that accompany the asymmetry of information, and therefore, it does not seem practical for land ownership to be consolidated beyond a certain level.

While comparatively small-scale land ownership exists in the form of private residences, it is logical that large-scale land with a single owner that is divided for small-scale land use, such as rented stores/offices or homes, is also found.

10.4   Conclusion

What interest economists with regard to land tax is the manner in which the use of the land changes according to the land tax system. They also discuss what type of tax system is preferable in order to achieve fair asset distribution and income distribution by analyzing the effect of changes to the land tax system on income and asset prices. The issue of changes made to land use and asset distribution by changing the land tax system is a theme that has long been discussed among economists.

Certainly, this can also be discussed regarding assets other than land. Financial assets can be taken as ownership of actual assets and/or have the right to claim certain monies. The typical pattern of the former is equity, while the latter takes the form of bonds and deposits.

However, taxes on financial assets do not directly influence the use of resources. Taxes on financial assets first influence the price of financial assets and revenue ratios. Subsequently, changes in asset prices change people's attitude toward risk, which results in an indirect influence on the demand for actual assets.

For example, portfolios are changed by taxing shares through changes in revenue ratios. This has an indirect influence on corporate management and the management of actual assets owned by companies. However, this path is incredibly complex and not easy to analyze.

In contrast, land tax is taxation on actual assets, which changes land revenue ratios, resulting in a direct influence on ownership and usage methods. Further, changes in land prices are directly connected to changes in asset distribution. In this manner, land tax influences the distribution of assets and the usage method of land as an important resource. Therefore, many economists have had a strong interest in this field for a long time.

To summarize the findings so far, property tax on housing and equipment should be abolished. Special measures for small-scale residential plots should also be abolished. However, property tax is an important revenue source for local governments in rural areas; therefore, revenue-neutral reforms to the tax system should be considered. To that end, the author would like to propose an increase in the effective fixed property tax rate on land. Property tax on land is clearly preferable over property tax on housing from the perspective of resource allocation and income distribution. If a tax reduction on housing is packaged together with a tax increase on land, landowners will not lose out.

Chapter 11
Requirements for the Application of Exemption from Real Estate Acquisition Tax Due to Purpose of Use: Based on the Acquisition of Land Usage for a School Site by an Incorporated Educational Institution

Nobuyuki Kobayashi

Abstract When an incorporated educational institution acquires real estate to establish a school, real estate acquisition tax is tax exemption. There are two interpretations of these tax exemption requirements: interpreting that real estate acquisition to establish a school is a requirement for tax exemption and interpreting that the establishment of a school is a requirement for tax exemption requirement. This paper discusses these tax exemption requirements, along with their accreditation standards and limited interpretation.

Keywords Real estate acquisition tax · Tax exemption requirements

11.1 Introduction

The public land purchased by the Incorporated Educational Institution Moritomo Gakuen (hereinafter referred to as "Gakuen"), which became a topic of social interest[1] in connection with the appropriateness of sale price of public land and the

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[1]Regarding this issue, the Director of Gakuen was summoned as a witness at the Budget Committee of the Diet (Dai 193 kai Kokkai Shugiin yosan iinkaigiroku dai 18 go [Minutes No.18 of the Committee of Budget of the House of Representatives in the 193th National Diet] (March 23, 2017), 1–14; Dai 193 kai Kokkai Sangiin yosan iinkai kaigiroku dai 15 go [Minutes No.15 of the Committee of Budget of the House of Councillors in the 193th National Diet] (March 23, 2017), 1–16).

N. Kobayashi (✉)
Kobe University Graduate School of Law, Doctoral Program, Kobe, Japan
e-mail: fujibitai5884@ares.eonet.ne.jp

approval of the establishment of an elementary school, was seized by Osaka Prefecture due to non-payment of real estate acquisition tax.[2] The tax was subsequently paid.[3] It was imposed on the acquisition of land that was to be used as an elementary school site, which Gakuen intended to establish because it later withdrew its application for the approval of establishing the school.[4]

Incidentally, real estate acquisition tax is a prefectural tax (Chihō zei hō [Local Tax Act], Art.1, para.1, item.4 and Art.4, para.2 item4. (hereinafter Act)) imposed on the acquisition of real estate (Act, Art.73–2, para.1), and it shall be exempted from the tax provided that certain requirements are fulfilled (Act, Art.73-3-73-7). This includes tax exemption (tax exemption based on Act, Art.74-4, para.1 hereinafter is referred to as "tax exemption due to purpose of use") in the case of real estate acquisition that is made in line with a purpose of use specified in one of the items in Article 73-4 paragraph (1), for example, a school site, grounds of a shrine or temple, or social welfare business (the purposes of use specified in the aforementioned items in that paragraph are hereinafter referred to as "purposes of use for tax exemption") by a party of a public nature such as an Incorporated Educational Institution, religious organization, or social welfare institution.

As for tax exemption for Incorporated Educational Institutions, the paragraph states that when an Incorporated Educational Institution acquires real estate with the purpose of "directly using for child care or education in a school established by an Institute (item (3) of the paragraph)," the acquisition cannot be subject to real estate acquisition tax (main paragraph). This paragraph prescribes tax exemption "in the case of acquisition for use," which, taken literally, implies that in the case that it is "acquired for a specified use," even if later it is not "actually used for childcare or education," the acquisition shall not be imposed on real estate acquisition tax.

However, the prefecture imposed real estate acquisition tax after Gakuen withdrew its application for the approval of the establishment of the elementary school.[5] The following processes led to this taking place. After an application was made by Gakuen on October 31, 2014,[6] the Osaka Prefectural Private School Deliberation Committee came to the conclusion on January 27, 2015, that "authorization is given

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[2]*See* Asahi Shimbun (morning), May 27, 2017, at 35; Sankei Shimbun (morning), May 27, 2017, at 28; Nihon Keizai Shimbun (evening), May 26, 2017, at 15; Mainichi Shimbun (evening), May 26, 2017, at 9; Yomiuri Shimbun (morning), May 27, 2017, at 34.

[3]*See* Asahi Shimbun (morning), May 31, 2017, at 30; Sankei Shimbun (morning), May 31, 2017, at 26; Nihon Keizai Shimbun (morning), May 31, 2017, at 39; Mainichi Shimbun (morning), May 31, 2017, at 28; Yomiuri Shimbun (evening), May 30, 2017, at 10.

[4]*See Id.*

[5]*See Id.*

[6]*See* Osakafu Kyōikuchō [Osaka Prefectural Board of Education Office] and Osa-kafu sōmubu [Osaka Prefectural General Affairs Department], *Gakkō hōjin moritomo gakuen Mizuho no kuni kinen Shōgakuin setchi ninka shinsei ni kansuru kenshō hōkoku* (April 6, 2017) [Inspection report regarding the application to authorize the establishment of the Incorporated Educational Institution Moritomo Gakuen Mizuho no Kuni Kinen Elementary Schoo (April 6, 2017)], 2.

due to the fulfilment of the requirements."[7] On June 20, 2016, Gakuen acquired the land for use as an elementary school site,[8] but on March 10, 2017, Gakuen withdrew its application.[9] Regarding this withdrawal, the (then) director of the school testified to the Budget Committee of the Diet that this was in line with the opinion of their representative lawyer: "in light of the current situation the private school board is unlikely to accept the application."[10] Responding to this, the prefectural governor who made the decision to approve the application recognized that "although there are now serious concerns about falsehoods in the papers submitted to the Committee, no one among the members of the Committee, or from the Private School Department, was aware that such carelessness was exercised in the submitted papers," and "had all the papers been correct and without falsehoods, [the school] could have opened on April 1, 2017."[11] The prefecture imposed real estate acquisition tax through this process, but at the time of acquisition of the land, it corresponded to "a case in which real estate is acquired to provide direct education at a school established on that site."

Therefore, based on the real estate acquisition tax imposed on Gakuen, this paper will examine the requirements for the application of tax exemption due to purpose of use. Specifically, first, the meaning of tax exemption due to purpose of use will be defined (Sect. 11.2). Second, we will examine whether the actual fulfillment of the purpose of tax exemption is included among the requirements for the application of tax exemption (Sect. 11.3). Third, the standards for fact-checking the requirements for the application of tax exemption will be examined (Sect. 11.4). Finally, based on a strict interpretation of the requirements for the application of tax exemption due to purpose of use (Sect. 11.5.1), we will consider the appropriateness of applying tax exemption due to purpose of use to Gakuen (Sect. 11.5.2).

11.2   Meaning of Tax Exemption Due to Purpose of Use

As shown in the introduction, Article 73-4, paragraph (1), regulates for tax exemption due to purpose of use. Regarding the meaning of this paragraph, Osaka Chihō Saibansho [Osaka Dist. Ct., July 5, 2012, LEX/DB 25483036 (hereinafter Osaka

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[7]*See* Osakafu shiritsu gakko shingikai tōshin [written reply of Osaka Prefectural Private Schools Council], No.15 (January 30, 2015), http://www.pref.osaka.lg.jp/attach/5807/00178564/270127toshin.pdf [Last accessed December 1, 2017.

[8]*See* Osakafu *supra* note 6, at 2.

[9]*See Id*.

[10]Dai 193 kai Kokkai Shugiin yosan iinkaigiroku dai 18 go [Minutes No.18 of the Committee of Budget of the House of Representatives in the 193rd National Diet] (March 23, 2017), 10 (statement by witness Yasuhiro Kagoike).

[11]Press Conference by Osaka Prefectural Governor, March 29, 2017 (statement by Governor Ichirō Matsui), http://www.pref.osaka.lg.jp/koho/kaiken/20170329.html [Last accessed December 1, 2017].

District Court Judgment)] states, "in such cases, it can be considered that the real estate is to be offered for a purpose of use with an objective that is in the public interest, and, therefore, in terms of policy, this item is interpreted to have the function of exempting the acquired real estate from tax in such cases." (Underlining by author; same hereafter.) Further, the Fukushima Chihō Saibansho [Fukushima Dist. Ct., June 24, 2014, TAINS Z999-8340 (hereinafter Fukushima District Court Judgment)] states that "the acquisition of real estate contributes to the interest of the public in general, and, therefore, by providing tax exemption, the activities of such corporations, among others, are promoted through the alleviation of the economic burden related to such real estate acquisition, which can also be understood as having the political objective of promoting public welfare."

According to the above statements, this paragraph is understood as providing tax exemption through policy from the perspective of public welfare. Furthermore, when comparing to whom this item is applicable and to whom it is not, regardless of whether they may otherwise be equally eligible for the application of real estate acquisition tax,[12] people who are eligible are considered as being tax exempt. Therefore, this item is understood as prioritizing the provision of favorable treatment toward eligible people over the fairness in the tax application.[13]

11.3 Do the Requirements for the Application of Tax Exemption Due to Purpose of Use Include the Actual Fulfillment of the Purpose of Tax Exemption?

As shown in the introduction, Article 73-4, paragraph (1), prescribes tax exemption when land is "acquired for use." Reading this literally, the only requirement in this item is acquisition for a purpose of use that is tax exempt (subjective requirement). While the policy objective of this item was created from the perspective of public welfare (Sect. 11.2), tax exemption would appear to contradict the intention of this item as it would not actually contribute to public welfare unless it was used for tax exemption purposes. Thus, in addition to the subjective requirement, it seems that this item would also include the requirement of actually fulfilling the purpose of tax exemption (objective requirement).

Therefore, this paper will now consider whether the application requirements for this item include only the subjective requirements (Subjective standard) or in

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[12]Regarding the ability to pay real estate acquisition tax, in *Hanrei Hihyō* [*Case Comments*] (Tokyo District Court, July 18, 1964), 16–17, Hiroshi Kaneko said that "the taxpaying ability to pay that acquires real estate is generally viewed with the assumption that the party has the ability to bear other economic burdens, and so taxpaying capacity here is conceptual, rather than realistically supported as in the case of income tax and revenue tax."

[13]*See* generally Hiroshi Kaneko, Sozeihō [Tax Law] 88–89, Kobundō (22th ed. 2017) (showing an overview of the discourse on the favorable tax measures).

addition to the subjective requirements, the necessity to fulfill the objective requirements (Objective standard).

11.3.1   Subjectivist Opinions

The following opinions are viewed as subjectivist.

Masayuki Takasaki's Opinion

Immediately prior to the establishment of the current real estate acquisition tax,[14] Masayuki Takasaki, a staff member of Jichi chō Fuken zei ka [Prefectural Tax Policy Division, Local Autonomy Agency] at the time, published his opinion regarding the evaluation criteria for acquisition for use, stating, "It is dependent on either the party having established a purpose of use that is prescribed in the items, or an objective and reliable assumption that it will use the real estate in line with the stated intention soon after acquiring the real estate."[15]

Ichiro Ishikawa's Opinion

In the year after the establishment of the current real estate acquisition tax, regarding the question, "f land acquired[16] by JR as a site for railroad tracks is neglected because of a change in construction plans, should it not be taxed as something not used for its original business purpose?" Ichiro Ishikawa, a then-staff member of Jichi chō Sōmu bu [General Affairs Department, Local Autonomy Agency], published his opinion that "the decision of whether or not to impose tax is determined by the recognition of the original business purpose at the time of acquisition. Therefore, even if the purpose of use is later altered, it cannot be taxed because the original business purpose at the time of acquisition was exempt from tax."[17]

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[14]Current real estate acquisition tax was established in 1954. The law was promulgated on May 13, 1954, but the opinion of Takasaki was published on April 1 of the same year (9 (4), zei, 148 (1954)).

[15]Masayuki Takasaki, *Fudōsan shutoku ze*i, [*Real estate acquisition tax*], 9 (4) Zei, 50, 53 (1954).

[16]At the time of making this statement, Act, Art.73-4, para. 1 regulated that "real estate acquisition tax cannot be levied... in the case that Japan Railways... acquired the real estate for use directly related to the actual business of Japanese National Railways as provided by government ordinance."

[17]Ichirō Ishikawa and Shunichi Kasai, Jitsurei Chihō zei Sōran, [Annual Report of Local Taxation] 187 (Ishikawa), Zeimu Tsushinsha (1955).

11.3.2   Opinions Understood to be Objectivist

The following opinions combine both subjectivist and objectivist statements. The underlined parts of each opinion can be read as objectivist, but the intention of those parts is not necessarily clear, and they are here included as opinions that can be understood as being objectivist.

Naohiro Ishida's Opinion

Naohiro Ishida (staff member of Jichi shō Fuken zei ka [Prefectural Tax Policy Division, Ministry of Home Affairs] during the making this statement) argued that "the recognition of tax exemption purposes of use is provided at the time of acquiring the real estate." Additionally, "such recognition must be made in reference to budget, business plans, minutes, asset lists, contributions, and certificates of relevant agencies as presented by the party acquiring the real estate." Finally, in the case that a purpose of use for tax exemption is presented after the acquisition of the real estate, as long as the real estate has not been used for any other purpose after acquisition, it can be considered that there are no objections to tax exemption, but tax should be imposed immediately if the purpose of use is altered to something that is not tax exempt. Therefore, in such cases, practically, tax is to be temporarily withheld, and when the purpose of use is presented, it must be processed for tax exemption at that time.[18]

Hiroshi Ishijima's Opinion

Hiroshi Ishijima argued, "recognition for the presentation of a fixed purpose of use is given at the time of the acquisition of real estate by means of budgets, business plans, minutes, asset lists, contributions, and certificates of relevant agencies from the corporation concerned. ... In the case that a purpose of use for tax exemption is presented after the acquisition of the real estate, as long as the real estate has not been used for any other purpose after acquisition, it is tax exempt, but it becomes the subject of taxation if the purpose of use is altered to something that is not tax exempt."[19]

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[18]Naohiro Ishida, *Chihō zei hō Chikujyō Kaisetsu: Rensai Fudōsan shutoku zei (6)* [*Local Tax Act point-by-point Interpretation: Real Estate Acquisition Tax (6)*], 31 (4) Chihō zei, 138, 142 (1980).

[19]Hiroshi Ishijima, Fudōsan shutoku zei to Kotei shisan zei no Kenkyu [Study of real estate acquisition tax and property tax], 189–90, Shinzansya (2008).

Mitsuaki Usui's Opinion

Mitsuaki Usui argued, "although one issue is that real estate is rarely used for purpose stated at the time of acquisition, the point in question is how should real estate be processed at the point when its purpose of use becomes definitive after it has already been treated as exempt from tax due to an 'expected use'. In cases where no presentation is made within a timeframe for exercising the right to impose tax, it is possible to do so retroactively."[20]

Hironori Urabe's Opinion

Hironori Urabe argued that rather than meaning "being acquired for use," it has the limited meaning of "directly providing childcare or education." That is, regarding the meaning of "use directly for the purpose of childcare or education," from "the legislative meaning of that regulation... the nature of the taxable item, or its literal interpretation," it is understood to mean a "case in which it is predicted with high probability that it will be used for childcare or education soon after acquisition based on the objectives at the time of acquiring the real estate (land)."[21] Moreover, as to "whether or not real estate acquisition tax is imposed when securing rights for the acquired land, etc., pertaining to the establishment of a school, etc., by an educational institution, ... at the stage of having acquired the real estate and having applied to establish an educational department, etc., it may seem that the real estate in question is neither one thing or the other as it may or may not be used for a purpose that is a target for tax exemption. However, rather than being a completely open-ended situation, it is actually highly likely that the real estate will directly be presented for use in the near future for either childcare or education because (1) it is possible to assume from the application for the establishment of an educational department, etc., that the intention or objective for the acquisition of the concerned real estate is "direct use for childcare or education" by the Incorporated Educational Institution; (2) in practice, it is highly likely that authorization for establishment will be given if the application for establishment of an educational department, etc., is accepted; and (3) if authorization for the establishment of an educational department is received, the real estate will definitely be used "directly for the purpose of childcare or education," and that this is not a blank condition. Instead, it being used for childcare or education directly in the near future is highly probable.

Further, "at the time of acquisition, as it is either 'all or nothing' in connection to... real estate acquisition tax, which corresponds to a tax on a transaction... while it is possible that this can be interpreted to mean that the Incorporated Educational

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[20]Mitsuaki Usui, Yōsetsu Chihō zei no Shikumi to Hō [Summary: Local Tax Law], 224, Gakuyō Shobō, (2001).

[21]Hironori Urabe, Sozeihō ni okeru Bunri kaishaku to Genkai [Interpretations and Limits in Tax Law], 841, Jigakusha (2013).

Institution has no obligation to pay tax, in a case where authorization is not given to establish an educational department or that the asset is not used for the purpose of direct education due to an existing educational department, based on the intention of the tax exemption regulation, it is logical that the tax office is able to retroactively levy tax at that time."[22]

11.3.3 Tax Practice

Tax is handled in practice in the following way:

"In the case that acquired real estate is presented for tax exemption purposes of use after acquisition, as long as the real estate has not been used for any other purpose after acquisition, there can be no objection to tax exemption. In practice, tax is to be temporarily withheld, and when the purpose of use is presented, it must be processed for tax exemption at that time. However, there is also currently a method whereby temporary tax procedures are imposed, and any tax payments are later returned when the tax is revoked at the point at which the real estate is presented for tax exemption purposes of use."[23]

11.3.4 Judicial Precedents

In addition to the subjective requirements, in terms of judicial precedents that show the necessity of objective requirements, the Osaka District Court Judgment, Fukushima District Court Judgment, and Sendai Kōtō Saibansho [Sendai High Ct., June 12, 2015, Heise 26 (gyo ko) No.15 (hereinafter Sendai High Court Judgment)] at Fukushima District Court Judgment appeal trial are all subjectivist, as shown below.

Osaka District Court Judgment

Osaka District Court Judgment can be summarized as follows.

Social welfare corporation X purchased land (referred hereafter the land in question) with the objective of constructing a child welfare institution. Later, based on the Land Readjustment Act, part of the land in question was reallocated. Therefore, X constructed the child welfare institution on the reallocated land and not on the land in question. In this regard, Osaka Prefecture decided to impose real estate

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[22]*See Id*. at 842.

[23]Eisuke Tahara, *Fudōsan shutoku zei no yōto hikazei* [*Exemption from real estate acquisition tax due to purpose of use*], 43 (9) Zei, 200, 202 (1988).

acquisition tax on the land in question acquired by X as it did not fulfill the tax exemption requirements stated in Article 73-4 paragraph (1) item (4-2) (now 4-3) because the child welfare institution was not constructed on the land in question. In objection to this, X filed a lawsuit in an attempt to revoke this decision.

The necessity of applying the objective requirements was argued in this case. Regarding this point, Osaka Prefecture claimed, "in view of the intention of the tax exemption regulations, the application of tax exemption regulations... requires that the land is actually used for a facility such as a child welfare institution." In this regard, the Osaka District Court argued, "if emphasis is placed on the implementation of policy objectives, rather than determining tax at the time of acquiring the real estate... in reality, at fixed intervals... it is likely that there would be a system in which exemption from real estate acquisition tax is given when the real estate is actually used in a way that fulfills the policy objectives." "Considering this, legislators... have the space to consider that the judgment of tax exemption was made if it is true that the real estate has been acquired for a purpose of use that is tax exempt, even if the said real estate is not actually used for a tax exempt purpose. Therefore... based on the meaning of the tax exemption regulations... it cannot be derived that the immediate use of the real estate for a tax exempt purpose is a requirement for tax exemption."

Moreover, Osaka Prefecture stated that based on the objective of the policy, there should be a restrictive interpretation of the tax exemption regulations, not an arbitrarily expansive one.

In this regard, the Osaka District Court argued, "certainly, regarding tax exemption regulations based on policy objectives,... from the perspective of ensuring fairness among taxpayers, the interpretation should not be arbitrarily expansive, and, as the defendant has rightly claimed, the interpretation and application should be rigid. However,... the addition to requirements that are not in the wording of the provisions are not a strict interpretation or application, as stated above, and it goes against the principle of taxation without representation as it is considerably injurious to the predictability of the system to taxpayers and legal stability and thus must not be permitted." "In view of the foregoing... while it is necessary to have the objective of using the real estate for tax exemption purposes of use (subjective requirement)... it should be understood that the actual use of the real estate for tax exemption purposes (objective requirement) is not a requirement."

Fukushima District Court Judgment

Fukushima District Court Judgment can be summarized as follows. Regarding the acquisition of a hospital ward by hospital management foundation X, Fukushima Prefecture made the decision to impose tax on the acquisition of the real estate. In response, X filed a lawsuit seeking this decision to be revoked, claiming that the real estate was tax exempt based on Act, Art. 73-4, para.1, item. 4-7, because the hospital ward was acquired for the purpose of services through which the needy are provided

with medical care, free of charge, or at low cost, Shakai fukushi hō [Social Welfare Act] Art. 2, para. 3 item. 9.

In the aforementioned case, the Fukushima District Court made the following claim:

"Act, Art. 73-4 , para.1 regulates for 'acquisition for use,' and a literal interpretation of this wording would mean that the requirement is for the real estate acquirer to have the objective of using the real estate for one of the items in that paragraph at the time of acquiring the real estate, and it is naturally understood that this is sufficient." "When looking at the tax exemption regulations... there is no wording that shows the requirement for actual use for a purpose stated in one of the items in that paragraph." "In view of the fact that real estate acquisition tax is based on 'the taxation of a party that is recognized as having the duty to pay tax based on the temporary fact of the acquisition of real estate...' it is obvious and logical to understand that the requirements for the application of tax exemption measures should also be determined on the temporary basis of the acquisition of real estate."

"Therefore...while having the objective of using the real estate for services through which the needy are provided with medical care, free of charge or at low cost is a requirement... the actual use of the real estate for services through which the needy are provided with medical care, free of charge or at low cost is not a requirement."

Sendai High Court Judgment

Sendai High Court Judgment stated that "whether it can be said that the building in question was acquired for use of services through which the needy are provided with medical care, free of charge or at low cost as a social welfare business is decided by the appellant's objective for the use of the building in question at the time of the acquisition of the building in question."

11.3.5   Analysis

Should Subjective standard or Objective standard be applied to the requirements for the application of tax exemption due to purpose of use?

Regarding this point, according to Objective standard, the standard is whether the real estate is actually used for tax exemption purposes, which has the advantage over Subjective standard in that it is easier to recognize the validity of tax exemption due to purpose of use. Additionally, if it is not used for a tax exempt purpose, it does not

contribute to public welfare, so it is more compatible than subjective standard with the intention of tax exemption due to purpose of use.[24]

However, Act, Art. 73-4, para. 1 regulates for "acquisition for use," making it difficult to be understood as including objective requirements in a literal sense. While Act also has a regulation that revokes real estate acquisition tax on the condition that certain circumstances are met within a fixed period of time after acquiring the real estate (for example, housing is newly constructed in line with the fixed requirements for the acquired land (Act, Art.73–24, para.1, item.1), or the transfer of the asset in question from the mortgage holder to the creator of the mortgaged asset (Act, Art.73-27-4, para. 1)), such regulations do not exist with regard to tax exemption due to purpose of use. From this perspective, there can be no recognition for the necessity of meeting objective requirements. This is because if objective requirements are needed, there would obviously be regulations in place limiting the period until the real estate is presented for tax exemption purposes of use. Furthermore, in view of the subjectivist statements of staff member of Jichi chō [Local Autonomy Agency] made immediately before, and in the year after, the creation of the current real estate acquisition tax (Sect. 11.3.1), it can be surmised Jichi chō [Local Autonomy Agency] produced the Act with subjective standard in mind. Furthermore, that assumption can be made from a literal understanding of Act, Art.73-4, para. 1. Based on the foregoing, a Subjective standard should be applied in the requirements for the application of tax exemption due to purpose of use.

11.4 Standards for Recognizing Subjective Requirements

As shown in Sect. 11.3.5, the validity of tax exemption due to the purpose of use should be determined based on the existence of subjective requirements. A recognition of the facts in this regard is provided by prefectures (or by courts in legal cases for the withdrawal of the decision to impose tax) as the tax authorities; however, there are two theories regarding the standards for recognizing these facts. One is the standard in which recognition should be given according to the facts at the time of acquisition (referred to hereafter as "standard of time of acquisition"). The other is the standard in which, in addition to the facts at the time of acquisition, recognition is given according to the facts after acquisition (referred to hereafter as "standard of comprehensive consideration"). We will subsequently consider which of these standards should be used.

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[24] *See* Fukushima District Court Judgment. (stated that "from the intention of the law, only cases in which the acquired real estate is actually used for services through which the needy are provided with medical care, free of charge or at low cost are consistent with the intention of providing tax exemption.")

11.4.1 Standard of Time of Acquisition

Hiroshi Nagashima takes up the standard of time of acquisition, stating, "the circumstances that should be considered to decide the requirements for the application of tax exemption in this case should be limited to the facts at the time of acquiring the real estate, and the facts after acquisition should not be taken into consideration. The reason for this is ability to pay should be determined at that point in time because it is unreasonable to go back to the taxpaying capacity at the time of levying tax (this seems to be a mistake for "time of acquisition"; same below) based on the facts after acquisition, that is, circumstances that are influenced by chance."[25]

11.4.2 Standard of Comprehensive Consideration

The following judicial precedents all take up the standard of comprehensive consideration.

Osaka District Court Judgment

Osaka District Court Judgment found the following:
   "There are facts regarding the purpose of the acquisition of real estate that are subjective to the acquiring party, and the recognition of such facts can be considered to be challenging, and so, based on the need for a strict examination regarding the application of the regulations for tax exemption in line with the policy objectives. . . the circumstances after acquisition cannot be denied in their entirety." "As to whether the real estate was acquired for tax exempt purposes of use, in addition to the facts that arise until the time of acquiring the real estate (the contract related to the acquisition of the real estate, the business plans, and the property status of the party that acquired the real estate) it is understood that authorization should be given based on whether the real estate is actually used for tax exemption purposes and various other facts, such as other details and reasons if the real estate is not used for tax exemption purposes." "With this understanding,. . . it is obvious if the real estate in question is not actually used for tax exemption purposes after acquisition, it is normal to infer from the facts that the purpose of use of the real estate was not tax exemption even at the time the real estate acquisition." "Authorization should always be based on whether the purpose of use, when acquiring the real estate, was for tax exemption, which is determined also with respect to the circumstances after acquisition,. . . and therefore, the application of tax exemption regulations in this

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[25]Hiroshi Nagashima, *Hanrei Hihyō* [*Case Comments*] (Fukushima District Court, June. 24, 2014), 8 Sozei Soshō, 327, 348 (2015).

case should not be made if the land is not used for tax exemption purposes that unavoidably arise due to a later situation."

Sendai High Court Judgment

Sendai High Court Judgment found the following:

"The purpose of use should be judged objectively with comprehensive consideration given to both the formal aspects, such as the submission of a notification of the beginning of a social welfare business by the appellant based on the stipulations for articles of endowment and Shakai fukushi ho [Social Welfare Act], and the tangible aspects, such as the actual activities performed by the appellant in the property. Further, the actual activities, etc., carried out by the appellant in the property should be recognized based on objective facts before and after acquiring the property (the objective determination of the purpose of use of the property at the time of acquisition is based on a consideration of objective facts from before and after the acquisition of the property, which does not contradict the fact that the timing of the evaluation standards for the purpose of use is the time of the acquisition of the property)." "Real estate that is acquired to provide services through which the needy are provided with medical care, free of charge or at low cost, which is a purpose that strongly favors public interest, is exempt from tax; therefore, real estate that is also used simultaneously for general medical care will also be exempt from tax. . . From this it can be understood that in cases where systems and equipment are in place in the real estate in question for the continuous provision of free or low cost medical services and that such free or low cost medical services are actually being repeatedly conducted on a regular basis, the real estate was acquired for the purpose of services through which the needy are provided with medical care, free of charge or at low cost, because this business that is strongly in public interest is actually being practiced."

11.4.3 Analysis

Regarding the standards for authorizing subjective requirements, should either the standard of time of acquisition or the standard of comprehensive consideration be used?

On this point, Hiroshi Nagashima, who takes up the standard of time of acquisition, argued, "It is illogical that the ability to pay tax retroactively is determined by circumstances after acquisition, i.e., by details that are influenced by chance."[26] Certainly, with the understanding that actually using the real estate for tax exemption

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[26]*Id.*

purposes of use is a requirement for the application of tax exemption, the taxpaying capacity is determined by "circumstances that are influenced by chance."

However, based on whether the real estate is actually used for tax exemption purpose and various other facts, such as other details and reasons if the real estate is not used for tax exemption purpose,[27] if the existence of subjective requirements is recognized, "ability to pay" is not "determined by circumstances that are influenced by chance." Further, "the purpose of the acquisition of real estate involves facts that are subjective to the acquiring party, which are difficult to recognize";[28] hence, there is a recognition for the need to take into consideration the circumstances after acquisition. Furthermore, as there are no laws limiting the recognition of subjective requirements,[29] it is permissible to consider the circumstances after acquisition.

Therefore, the standard of comprehensive consideration should be applied to the standards for recognizing subjective requirements.

11.5   The Meaning of "Acquisition for Use"

While all the judicial precedents in Sect. 11.3.4 take up Subjective standard, regarding the interpretation of "acquisition for use," the degree of probability that the real estate will be used for tax exemption purposes at the time of acquisition is not specified. Despite this, Osaka District Court Judgment found the following: (1) "It is obvious if the real estate in question is not used for tax exemption purpose after acquisition; it is normal to infer from the facts that the purpose of use of the real estate was not tax exemption even during the real estate acquisition." Certainly, the interpretation in (1) is valid if the scope of "acquisition for use" is limited to cases in which there is a high probability that the real estate will be used for tax exemption purposes at the time of acquisition. However, if this also includes cases of low probability, the interpretation in (1) is invalid. This is because if in the case of said low probability, real estate is commonly used for a purpose that is not tax exempt after acquisition, which is why the District Court should have clarified the scope. Besides this, Sendai High Court Judgment found the following: (2) "It can be understood that the real estate was acquired for the purpose of services through which the needy are provided with medical care, free of charge, or at low cost. . . in the case that free or low cost medical services are actually being repeatedly conducted on a regular basis."[30] In (2), it is understood that the real estate was

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[27]Osaka District Court Judgment.

[28]*Id.*

[29]*See* Fukushima District Court Judgment.

[30]*See Id.* (also found that "it is appropriate to understand that, until the time of acquiring real estate. . . there should be a recognition of the repeated and frequent provision of free or low cost medical services (in the case of continuing business),. . . or within a reasonable time after acquiring the real estate,. . . there should be a recognition of the repeated and frequent provision of free or low cost medical services (in the case of new business)")

"acquired for use" because it is actually used for a tax exemption purpose. However, there is a contradiction between the Subjective standard taken up by the High Court (Sect. 11.3.4) and (2) (objective standard is consistent with (2)).[31]

The above shows that there are issues with interpreting the aforementioned judicial precedents. Therefore, the interpretation of the meaning of "acquisition for use" will now be considered.

11.5.1 Analysis

"Acquisition for use" is a requirement for the application of tax exemption due to purpose of use. How should the regulations for these tax exemption requirements be interpreted? Regarding this, Sendai Kōtō Saibansho, [Sendai High Ct.] January 22, 1975, gyoshu [Administrative Case Reports], Vol. 26, No. 1, p. 3, states that, "while there may be no objection to a narrow and strict interpretation of taxation law and particularly to regulations for tax requisition, regulations for tax exemption requirements in taxation law can be understood as having an exceptional status if regulations for tax requisition are considered to be a general principle, and, substantially, regulations for the requirements for tax exemption are theorized from a financial or politico-economic perspective that is somehow different from the regulations for tax requisition, and, therefore, the demand for the aforementioned narrow and strict interpretation in the applied interpretation of taxation law should be emphasized even further in the applied interpretation of the regulations for tax exemption requirements because they have a so-called obstructive influence in some sense on the concept of the fairness of tax burdens, etc., that the regulations for tax requisition attempt to continually implement."[32]

Such an interpretation may also be suitable with regard to the requirements for the application of tax exemption due to purpose of use.

From what perspective, then, should "acquisition for use" be interpreted in a narrow and strict sense? Regarding this point, the following two theories are useful as a reference:

The first is a standard proposed by Takasaki (Sect. 11.3.1). Takasaki states regarding the standard for judging "acquisition for use" that "It is dependent on either the party having established a purpose of use that is prescribed in the items, or an objective and reliable assumption that it will use the real estate in line with the stated intention soon after acquiring the real estate."[33] This standard was advocated

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[31]*supra* note 25, 346, Nagashima states that there is a "clear contradiction" in the findings from Fukushima District Court Judgment *supra* note 30, etc., and the findings shown in Sect. 11.3.4.2.

[32]Saikō Saibansho [Sup. Ct.] July 18, 1978, 24(12) Shōmu geppō 2696, which is the appeal trial ruling for the aforementioned High Court ruling, states that "the original sentence is deemed to be correct because tax exemption regulations should be strictly interpreted."

[33]Takasaki *supra* note 15, 53.

by a staff member of Jichi chō [Local Autonomy Agency] immediately before the creation of the current real estate acquisition tax in "Showa 29 nendo chiho zeisei kaisetu tokushu [Explanations on the 1954 Local Tax revision]"[34] which presumably was the standard held by the local government office that produced the law, and therefore, it can be referred to when interpreting "acquisition for use."

Another standard is by Hironori Urabe (Sect. 11.3.2). Urabe states that "the meaning of 'use for the purpose of direct care or education'" is "a case in which it is predicted that there is a high probability that soon after the acquisition it will be used for nursing or education based on the objectives from the time of real estate (land) acquisition."[35] This standard does not interpret "acquisition for use," but it is consistent with the opinion of Takasaki with regard to the direction of the interpretation. Although both standards include the period up to the use of the real estate for tax exemption purposes and the degree of probability that the real estate will be used for tax exemption purposes, they are still valid. This is because if it is assumed that there will be a lengthy period of time between acquisition and the use of the real estate for a tax exempt purpose, or, if the probability that it will be used for a tax exempt purpose is low, it is unreasonable in terms of fairness among taxpayers that tax exemption should be granted even in such situations despite the fact that there is some small probability that it will be used for a purpose that is not tax exempt.

Additionally, as shown in the standards above, after the acquisition of real estate, if an objective and reliable assumption or a prediction with high probability can be made that the real estate will be used for tax exemption purposes in "the near future" or "soon after," it can be said that the real estate will normally be used for tax exemption purposes after acquisition. Even in such cases, it may not be used for tax exemption purposes. For example, there have been unavoidable situations in which, through no fault of the acquiring party, the acquired real estate cannot be used due to expropriation or land reallocation, for example, or due to the destruction of the acquired real estate in a natural disaster.

Based on the above, "acquisition for use" should be understood as implying acquisition with the intent of using the real estate for tax exemption purposes within a reasonable period of time after acquisition, provided there are no unavoidable circumstances for which the acquiring party is not to blame.

11.5.2 Suitability of Tax Exemption Due to Purpose of Use in the Case of Gakuen

In the case that "acquisition for use" is understood as per the meaning provided in Sect. 11.5.1, should tax exemption due to purpose of use be applied in the case of land acquisition by Gakuen? Regarding this point, after making an application for

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[34]9(4) Zei, 2 (1954).

[35]Urabe *supra* note 21, 841.

the authorization to establish an elementary school, Gakuen acquired the land 10 months before the date on which the elementary school was scheduled to open, which, as long as there were no extraordinary problems, is consistent with "acquisition for use."

However, Gakuen later withdrew its application and did not establish the elementary school. The reason being the falsification of the application forms, as recognized by Osaka prefectural governor, and it can be thought that Gakuen would have established an elementary school if the falsehoods had not been present (Sect. 11.1). Further, if it was impossible to make corrections to the application documents, Gakuen did not acquire the real estate with the intention of using it for tax exemption purposes of use within a reasonable time frame after acquisition, provided there were no unavoidable circumstances for which the acquiring party was not to blame (falsified application documents that existed at the time of acquisition is a factor in the recognition of subjective requirements even if it was found only after acquisition); hence, tax exemption due to purpose of use cannot be applied.

11.6   Conclusion

This paper has considered the requirements for the application of tax exemption due to purpose of use in connection to real estate acquisition tax. Regarding this point, in practice, tax is either exempted or revoked when real estate is presented for tax exemption purposes (Sect. 11.3.3). However, tax exemption due to purpose of use only has the subjective requirement of acquiring real estate for tax exemption purposes (Sect. 11.3.5), which should be amended if it is understood that the application of tax exemption due to purpose of use also has the objective requirement of actually using the real estate for tax exemption purposes.

The regulation for tax exemption due to purpose of use was established with the objective of achieving things in public interest (Sect. 11.2); therefore, it should be interpreted in a narrow and strict sense from the perspective of maintaining fairness among taxpayers (Sect. 11.5.1). When understood in this way and by applying the standard of comprehensive consideration (Sect. 11.4.3) in which authorization for the subjective requirements should be given based on the circumstances after acquisition along with the circumstances during acquisition, the correct extent of the scope of application of tax exemption due to purpose of use becomes clear, and the difficulty of proving the facts in connection with the subjective requirements is mitigated.

Chapter 12
Dual Agency, Commission Levels, and the Effect on Sale Price in Residential Real Estate Market: A Questionnaire Survey on Real Estate Brokers in Japan

Keiichi Shirakawa and Toshiyuki Okoshi

Abstract In residential real estate market, agents have an incentive to steer their clients to their own listings or buyers rather than offering the best value transaction, which is derived from allowing dual agency and information asymmetry among buyers, sellers, and agents. We estimated the commission levels and sale prices of real estate brokers through a questionnaire survey and found that seven out of ten brokers are closing dual-agency deals and lowering sale prices. We could not find any effects of the number of employees, location of office, and major types of contract on dual agency.

Keywords Real estate brokerage · Dual agency · Information asymmetry · Agency problem

12.1 Background and Purpose

12.1.1 *The* Kakoikomi *Problem*

How to increase the share of existing homes in Japan's housing market has been a major issue. According to the Housing and Land Survey of the Statistics Bureau, Ministry of Internal Affairs and Communications, the share of existing homes has accounted for 10−20% in the housing market for almost the past 20 years.

K. Shirakawa (✉)
Land Institute of Japan, Tokyo, Japan
e-mail: shirakawa@tochi.or.jp

T. Okoshi
Land Institute of Japan, Tokyo, Japan

Reitaku University, Chiba, Japan
e-mail: tokoshi@reitaku-u.ac.jp

It has been pointed out that one of the obstacles for stimulating existing home market is *Kakoikomi*. *Kakoikomi* is the act whereby a seller's agent hides the existence of other potential buyers (clients of competing agents) from the seller by telling a lie, for example, "I am already in negotiations with an another buyer," in order to close a dual-agency deal and earn commissions from both buyer and seller in one transaction.[1] Dual agency is broker's representation of both the seller and the buyer in the same transaction. Since the broker does not inform the client (seller or buyer) that he or she is acting as a dual agent in such cases, *information asymmetry* arises between the broker and the client in relation to the broker's behavior, resulting in a possibility that the transaction may prove disadvantageous for the client. In many states in the US, the broker is legally obliged to inform clients that he or she represents both clients when acting as a dual agent.[2] (Although there is no distinction between the agency agreement and the mediating agreement in Japan's real estate transactions, dual agency and dual mediation are not necessarily the same unless the transaction has come into effect. However, the two are indistinguishable for cases where transactions have already concluded, then we call both "dual agency.")

According to Jutaku-Shimpo, Inc., the average commission level of the 10 major residential real estate brokerage companies in 2015 was 4.02%, which exceeded the upper limit for a single-agency transaction of 3% + 60,000 yen. If all transactions were under a single agency, the average commission level per transaction should be 3% + 60,000 yen at most.[3]

12.1.2   Information Asymmetry in Existing Home Market

The problems caused by information asymmetry in existing home market can be classified into two categories: problems of hidden information and problems of

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[1]The Real Estate Brokerage Act imposes a duty on the broker to register related data with the Real Estate Information Network System (REINS) when the exclusive mediation agreement is concluded and prohibits the broker from intentionally concealing information from the other party of the contract or monopolizing it.

[2]In the US, as a result of state's own legislation, there are (1) several states that, while permitting various types of dual agency, oblige the broker to disclose to both the seller and the buyer that he or she is a dual agent (e.g., New York), (2) a small number of states permit designated dual agency, i.e., they prohibit dual agency by the same person, but permit the dual agency within the same branch or the same firm (e.g., Colorado, Maryland), and (3) other states that, instead of prohibiting dual agency, permit transaction brokerage that does not legally represent either the seller or the buyer (e.g., Florida) (Kadiyali et al. 2014). The effectiveness of the obligation by the state laws is secured through the possibility of nullification or suspension of real estate agents' or brokers' licenses that are prescribed through such state laws (Olazabal 2003, pp. 70–71).

[3]The upper limit for the mediation fee prescribed in accordance with the Real Estate Brokerage Act is 5% for transaction amounts under 2 million yen, 4% for transaction amounts under 4 million yen, and 3% for transaction amounts of 4 million yen or more (all excluding tax); when an additional amount below 4 million yen is aggregated, it results in 3% + 60,000 yen.

hidden action. The former are the problems between the seller and the buyer, whereas the latter are the problems between the seller/buyer and the broker.

The Problems of Hidden Information

In a real estate property transaction, the seller has much more information about the property than the buyer. The seller knows much more on the condition of the property that is not evident on the surface as well as the transaction history, which the seller obtained when he or she purchased the property in the past. By contrast, the buyer faces the risk of purchasing poor-quality property, which reduces the level of willingness to pay for the property. Consequently, even if the seller invests in an old property, such investment is not appropriately evaluated by the market, resulting in adverse selection and the transactions of only poor-quality properties, causing the market to be full of lemons.[4] Thus, the quality of existing homes supplied to the market declines, and existing home market becomes inactive.

In the real estate market, where there tends to occur adverse selection with hidden information, rather than conducting direct transactions between the seller and the buyer, it is effective to engage full-time real estate brokers with experience and knowledge about similar real estate transactions as intermediaries, provided that the problems of the hidden action referred to later can be ignored. Buyers can get the property information and past transaction history through brokers, enabling them to better negotiate with the seller. The existence of brokers contributes to prevent the market from becoming full of lemons by avoiding adverse selection.

The Problems of Hidden Action

The problem of adverse selection with hidden information occurs regardless of the intent of the seller or the seller's broker. By contrast, the problem of moral hazard emerges when brokers act to conceal potential seller or buyer to their client and is intentionally instigated by brokers.

The broker can act as a dual agent and control the transaction to be made between the specific buyer and seller, both of whom are represented by the broker, by not giving the buyer enough information, such as the types of properties being sold and the types of sellers in the market, and by not informing the seller of the price at which buyers will purchase property in the market. This is referred to as *Kakoikomi*. This type of behavior cannot be avoided as long as the seller and buyer are unable to monitor it. If the broker succeeds in closing a dual-agency deal, the broker can obtain a fee of up to 3% + 60,000 yen from the seller as well as from the buyer for one transaction; consequently, brokers have an incentive to pursue a dual-agency deal.

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[4]Yamazaki (1997), Takahashi (2009), and Nakagawa (2014) identify similar problems in the real estate market.

The mitigation of information asymmetry between the seller and the buyer by promoting real estate transactions through mediation has merits for both parties. In particular, in a dual-agency deal, as noted by Kadiyali et al. (2014), the broker knows such as the preferences of both sides which can accelerate and improve the efficiency of negotiations during the transaction[5]. However, *Kakoikomi* occurs if dual agency is permitted and the broker is able to intentionally hide potential sellers and buyers. The merits of the mediation transaction over the direct transaction are eventually offset by such demerits.

The Impact of Dual Agency on Sale Price

If there were a legal requirement for the broker to disclose when acting as a dual agent, as there is in the US, the seller as well as the buyer would be able to confirm if the transaction proposed by the broker is disadvantageous compared to proposals by other brokers. And if so, the buyer or seller could decline the mediation.[6] In addition, for the broker, too, there is an incentive to conduct fair mediation transactions that are not disadvantageous to either sellers or buyers. Therefore, any difference in the sale price is unlikely, regardless of whether the broker closes a dual-agency deal or not. However, this requires following conditions: (1) the broker shall take a stance that is not biased toward either the seller or buyer and (2) there shall be no difference in the negotiation power between the selling and buying brokers. Kadiyali et al. (2014) argue that whether dual agency affects sale price to be higher or lower depends on which side (i.e., the seller side or the buyer side) is taken by the broker, so its impact is not necessarily definitive. If taking the seller side, the sale price will be higher and the commission received increases proportionally, whereas if the buyer side is taken, the sale price will be lower in the sense that the broker fails to mediate the transaction with the most desirable customer for the broker. Nevertheless, having said this, if the broker fails to lead the transaction to his or her own customer, the impact on the sale price will be zero.

Whether brokerage companies closing dual-agency deals are successfully raising the sale price to increase their mediation fee income and what types of companies

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[5]Kadiyali et al. (2014) observe the merits of dual agency as being (1) information and transaction efficiency as well as (2) an expansion of the property transaction mediated by brokers. Conversely, the demerits are cited as being (1) incentive to induce the seller to make a transaction with a buyer as one's own client at a lower transaction price than the maximum amount that the (potential) buyers are willing to pay, (2) the selective provision of information to clients, and (3) the pressure on both the seller and the buyer. All these demerits can be a cause for *Kakoikomi*.

[6]Regardless of whether there is an obligation for prior notification when closing a dual-agency deal, if a status monitoring that enables the seller to browse REINS and confirm the buy inquiries for his or her own property is available, the seller's broker is unable to behave in a manner that is disadvantageous for his or her client, such as causing a transaction to be concluded at a price that is below the market price.

successfully increase the probability of concluding dual-agency transactions (hereinafter referred to as *matching probability*) should be clarified by empirical survey.

12.1.3 Research Purpose

Based on the above discussion, the existence of two conditions, that (1) dual agency is permitted and (2) the client (seller, buyer) is unable to monitor the broker, is considered to increase the matching probability through dual agency and as a result, generate high fee income as well as impact the sale price.

However, there is an insufficient amount of quantitative research regarding the behavior of transaction participants in Japan's real estate market, and there is still no clear information on the current status of dual agency in existing home market.

Thus, this research first quantitatively clarifies the state of mediated transactions in Japan and then considers (1) the attributes of the company who closes a dual-agency deal and (2) how dual agency affects sale price.

In Sect. 12.2, we clarify how transactions are mediated where dual agency has been disclosed based on existing studies of dual agency in the US. In Sect. 12.3, we estimate the frequency of dual-agency deals in Japan by taking the mediation commission level as a proxy variable, based on a questionnaire survey on brokers. In Sect. 12.4, we analyze the impact on the commission level by the attributes of the company, and in Sect. 12.5, we examine the impact of dual agency on the average contract amount.

12.2 The Impact of Dual Agency in the US

Gardiner et al. (2007) compared 1,989 transaction data from 1977 to 1980 with 1,858 transaction data from 1987 to 1989 around the time that state law was enacted in 1984 requiring real estate agents engaged in dual-agency relationships to disclose this fact to both the seller and the buyer in Honolulu, Hawaii. They indicated that dual agency had the effect of reducing the sale price, and that such effect significantly reduced (from around 8.0% to 1.4%) following the enactment of the state law. This research can also be taken to suggest an expected effect of mandatory disclosure of dual agency in Japan.

Evans and Kolbe (2005) reported that, based on a sample of 4154 houses, each of which was sold more than once between 1997 and 2003 in Memphis, Tennessee, the impact of dual agency on the sale price had no statistical significance for the first transaction, whereas there was a small yet significant impact for the second transaction.

Kadiyali et al. (2014) clarified that dual agency had no impact on the sale price based on a regression analysis that took the sale price as the dependent variable with 10,888 transaction data from 2004 to 2007 in Long Island, New York (Table 12.1).

Table 12.1 Comparison of the state of dual-agency and single-agency transactions in Long Island, New York

	Dual agency	Single agency
Mean of sales price ($)	570,957	566,841
Mean of list price ($)	603,003	591,381
Mean of time-to-sale (days)	82.0	84.2
Number of samples	5247	5641

Source: Kadiyali et al. (2014), p. 178

Note: About half (48%) of all transactions occurred via dual agency; dual-agent deals (26%), within-branch deals (19%), and within-agency deals (3%)

However, conducting additional analysis by adding the list price as a variable, they note that dual agency has no net effect on the sale price due to the combination of the following two effects: (1) the broker who concludes a dual-agency transaction obtains a higher sale price by exploiting information on buyer clients' preference, and (2) the dual agent favors the buyer over the seller through the negotiation process, by leaning on the seller to accept the buyer's offer or by disclosing confidential information only to the buyer, etc.

As noted above, according to previous research that examined the impact of dual agency in the US, it is clear that no difference exists between the sale prices of dual and single agencies. In this regard, although there has been no past research concerning the degree of impact on the sale price, adequate information disclosure can be considered one of the main factors in reducing the sale price differential.

12.3 The State of Mediation Fee Setting in Japan

12.3.1 Questionnaire Design

In Japan, there is no comprehensive property information data base such as the Multiple Listing Service in the US. Therefore, it is extremely difficult to directly clarify the mediation commission levels set by each company for each transaction.

Consequently, this questionnaire survey is conducted on a broker-by-broker basis, with the normal level of mediation fee per property for each company calculated by dividing the total amount of mediation fee by the total contract amount of brokerage in 2014. In this study, the commission level is taken to be a proxy variable for whether a dual-agency deal is closed or not. In particular, if the commission level is higher than the upper limit that can be generated for a single agency of 3% + 60,000 yen for a company, it is likely that said the company has been a dual agent.[7]

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[7]Since laws and ordinances prescribe only the upper limit for commission level and lower commission levels are possible in actual transactions, dual agency cannot be determined only from the value of the commission level, and we can only indicate the possibility of dual agency. For example, even if the commission level were below 3%, it may mean that the broker is receiving

At the time the target list of brokers is to be created, there is no public list that covered the brokers nationwide. Therefore, we obtained a list of brokers to the extent that their cooperation was forthcoming and created a target list of companies. First, we obtained a list of survey targets in the Real Estate Industry Diffusion Survey conducted by the Land Institute of Japan and identified 73 companies (large enterprises and SMEs) engaged in real estate business in three major cities (Tokyo, Osaka, and Nagoya) and major cities in other areas. Second, 326 companies participating LIXIL ERA network and Renewal Brokerage Agency Inc. were obtained. Third, 101 companies participating Association of Real Estate Agents of Japan (Fudosan Ryutsu Keiei Kyokai or FRK) were obtained from the website, HomeNavi.[8] Fourth, 527 companies were obtained from the Executive Officers Register (FY2012 and FY2013) of the Prefectural Real Estate Associations (Todofuken Takuchi Tatemono Torihikigyo Kyokai), which is published on the Internet.[9] Adjustments for duplication were made for these companies, resulting in a final target list of 1000 companies.

We sent a questionnaire by post during the period from January 13 to February 10, 2015. The number of valid responses was 247 companies (a response rate of 24.7%).

Most of responded companies were small brokers; of these companies, approximately 70% had been in operation for 25 years or more, around 60% had five employees or fewer, and more than 80% had only one office (Table 12.2).[10]

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an individual fee of 1.5% from the seller as well as from the buyer. In addition, for properties with low sale price, the fixed portion of the fee (60,000 yen) has a large impact on the commission level (e.g., in the case of a 6-million-yen property, 60,000 yen = 1%).

[8] http://www.homenavi.or.jp/corp

[9] The extracted numbers are Hokkaido, 20; Iwate, 10; Miyagi, 20; Fukushima, 10; Ibaragi, 20; Saitama, 35; Chiba, 35; Tokyo, 62; Kanagawa, 35; Niigata, 15; Ishikawa, 15; Aichi, 50; Kyoto, 30; Osaka, 60; Hyogo, 30; Hiroshima, 30; Tokushima, 20; and Fukuoka, 30.The addresses of businesses located in Miyagi, Saitama, Chiba, Tokyo, Aichi, Kyoto, Osaka, Hyogo, Hiroshima, and Fukuoka are from a web search based on the name mentioned in the Executive Officers Register or their trade names (company names).

[10] We compared the number of employees and the number of years of operation in our data with the data of registered real estate brokers at the end of FY2015 published by the Real Estate Transaction Improvement Organization. As a result of the test of independence, our data contains significantly less sole proprietors and more brokers with long years of operation. Note that there was no significant location bias of companies. In the above analysis, the small number of sole proprietors and the large number of brokers with long years of operation make it necessary to consider the possibility that these boosted the overall matching probability of dual agency.

Table 12.2 Breakdown of responding companies

Number of years of operation			Number of employees			Number of offices		
	#	%		#	%		#	%
1	3	1.2	1	17	6.9	1	208	84.2
1–4	9	3.6	2–5	126	51.0	2–5	29	11.7
5–9	13	5.3	6–10	49	19.8	6–10	3	1.2
10–24	52	21.1	11–50	40	16.2	11–50	4	1.6
25–	170	68.8	51–100	6	2.4	51–	3	1.2
Total	247	100.0	101–1000	6	2.4	Total	247	100.0
			1001–	3	1.2			
			Total	247	100.0			

Note: Business offices of Article 8 (2) (v) of the Real Estate Brokerage Act

Table 12.3 Basic statistics

	Mean	S.E.	Median
Number of contracts	407.28	3331.3	10
Total contract amount (billion yen)	19.895	137.5	0.3
Average contract amount (million yen/transaction)	33.098	46.248	21.117
Commission level (%)	4.1367	1.6013	3.85

12.3.2 Relationship Between Dual Agency in the Commission Level and Contract Amount

The total amount of mediation fee and the contract amount were obtained from 155 companies out of the 247 companies. The mean of average contract amount calculated by each company by dividing the total contract amount by the number of contracts (calculating the dual-agency transaction as one transaction) was 33.1 million yen/transaction, with a commission level of 4.1% (Table 12.3). As illustrated in Fig. 12.1, 70% of companies are taking a fee on average of more than 3% per transactions for mediation.[11]

Figure 12.2 illustrates the relationship between the calculated mediation commission level and the average contract amount calculated by dividing the total contract amount by the number of contracts. The correlation coefficient is -0.238; the result of a test of no correlation had t-value $= -3.03$ and P-value $= 0.00284$. There was a weak correlation in that companies with high mediation commission levels tended to have low average contract amounts.

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[11]Twenty-one companies had mediation commission levels in excess of 6%, and the highest value was 10%. The maximum fee that can be obtained from dual agency is 6% + 120,000 yen; for example, assuming a transaction of a 4-million-yen property with dual agency, the fee would be a maximum of 240,000 (6% of 4 million yen) + 120,000 = 360,000 yen or as high as 9% of the sale price. Given the impact of the fixed amount of 120,000 yen, a commission level in excess of 6% cannot necessarily be considered as an unusual value.

Fig. 12.1 Histogram of mediation commission levels
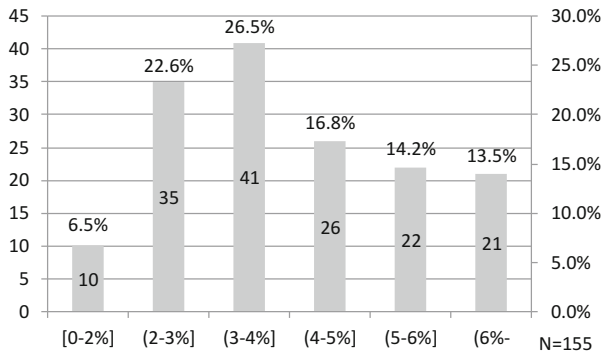
Fig. 12.2 Mediation commission level and average contract amount
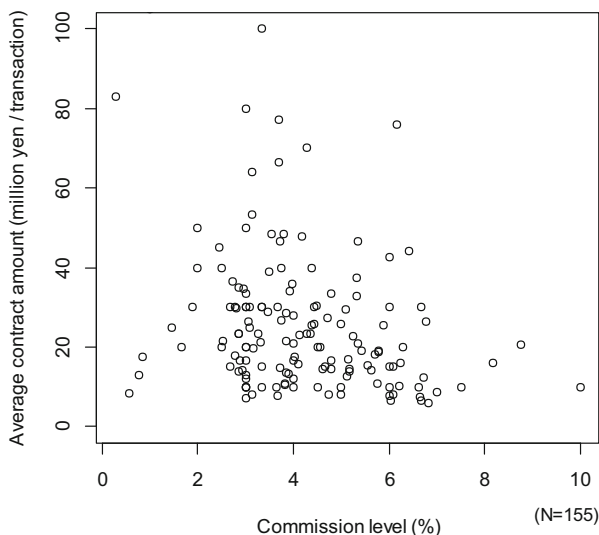
   Companies with commission levels below 3% are not only companies that handle high value properties with large average contract amounts but also include companies handling small value properties with small average contract amounts. In the case of companies handling small value properties, it is thought that they would be unable to secure profits unless they set mediation commission levels at the upper limit. However, it became evident that there are companies actually that keep commission levels below the upper limit even among companies handling small value properties.

Table 12.4 Response concerning the basis for setting the mediation commission level

Criteria for commission level	#	%	Average commission level
Set at the upper limit on the law	138	89.0	4.2215
Apply the company's own standard	3	1.9	3.2717
Although there is a standard, the actual amount is reduced according to the situation	9	5.8	3.4012
No answer	5	3.2	3.64
Total	155	100.0	

12.3.3 Proportion of Companies Setting the Commission Level at the Upper Limit

When brokers close dual-agency deals, they do not necessarily set their fees at the upper limit. Therefore, even if the commission level calculated from the final contract amount and fee income is 3%, it is possible that the broker charges the seller and the buyer separately, for example, a fee of 1.5% each. Consequently, estimating the mediation commission level from the above method alone cannot provide the exact level of brokers' fee for specific transactions.

We asked directly the companies that responded to the question concerning the mediation commission level whether they charged the upper limit of the fee. Over 80% of those companies said that they set the commission level at the upper limit on the law (Table 12.4). In addition, upon calculating the average commission level for each respective item, all exceeded 3% and the ANOVA result showed no significant difference in the average commission levels among the groups (F-value $= 1.585$, P-value $= 0.208$). Without being able to increase the commission level, it is necessary for brokers to close a dual-agency deal to obtain a higher fee from a single transaction. Many brokers are constantly taking the fee at the upper limit, which suggests that there is a strong incentive for most brokers to pursue dual-agency deals.

12.4 Impact of Company Attributes on the Mediation Commission Level

12.4.1 Impact from the Scale of the Company and Market

To conclude a dual-agency transaction requires an increase in the matching probability by either the broker having adequate numbers of sellers and buyers on its customer list or there being adequate numbers of sellers and buyers in the market.[12]

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[12]If the market is large, there will be an increase in the matching probability not only for dual agency but also for single agency.

Table 12.5 Regression analysis taking the commission level as the dependent variable

	(A) all companies ($N = 155$)		(B) set at the upper limit ($N = 138$)	
	Coef.	S.E.	Coef.	S.E.
Intercept	0.042380	0.002032***	0.042488	0.002105***
Dummy of # of employees				
1–5	(baseline)	–	(baseline)	–
6–10	−0.002767	0.002729	−0.002562	0.002871
11–	−0.010400	0.005467*	−0.009257	0.005843
Dummy of location				
Major city area	0.001360	0.002635	0.002801	0.002843
Other area	(baseline)	–	(baseline)	–
R^2	0.02596		0.02297	
Adjusted R^2	0.006603		0.001093	

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

Thus, we conducted a regression analysis with the mediation commission level which we used as an indicator of dual agency as dependent variable, and the number of customers covered by each broker and the size of the market as independent variables.[13]

Since the number of customers covered by each broker is not known from this survey, the number of employees is used as a proxy variable to indicate the scale of a company's sales. The dummy variables that group the number of employees into 1 to 5, 6 to 10, and 11 or more are taken to be independent variables. In addition, as a proxy variable to indicate the scale of the market for the location of brokers, companies that provided their addresses in the questionnaire (200 out of 247 companies) were assigned dummy variables that grouped the locations as either being inside or outside the prefectures (Tokyo, Kanagawa, Chiba, Saitama, Aichi, Osaka, Kyoto, and Hyogo) located in or near the three major cities (Tokyo, Osaka, and Nagoya).

The results are presented in Table 12.5 (A). The dummy for 11 or more employees has statistical significance at 10% and is recognized as pushing down the commission level by around 1%.

As discussed in Sect. 12.3.3, there are cases of dual-agency transactions being closed with reduced commission level. Therefore, when using commission level as a proxy variable for dual agency, a certain degree of measurement error is generated. We checked the robustness by conducting another analysis limiting the sample to the companies that responded that they set the commission level at the upper limit. The result is presented in Table 12.5 (B). We couldn't find any significance for both the dummy of employees and the dummy of location. The significance of the dummy for 11 or more employees disappeared because the effect of boosting the commission level from dual agency was not as large as the downward impact on commission

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[13]We used R3.3.2 for estimation. The listwise deletion was used for the missing value. Hereinafter, the same shall apply.

level from both dual and single agency for large companies. Unlike we supposed above, the significance of the dummy for 11 or more employees disappeared.

12.4.2 Impact Due to Differences in the Main Types of Mediation Agreements

There are three types of contracts for mediation agreements exchanged when requesting a real estate broker to mediate: non-exclusive mediation agreement, exclusive mediation agreement, and privileged and exclusive mediation agreement. A non-exclusive mediation agreement enables the seller to request another real estate company to act as an intermediary, whereas an exclusive mediation agreement does not allow such a request. In addition, although the seller can make a transaction with a counterparty that he or she finds on their own under an exclusive mediation agreement, this is not allowed under a privileged and exclusive mediation agreement.

In the case of a non-exclusive agreement, brokers compete with rival companies for concluding the contract, so a fee is not necessarily received. Brokers tend to benefit by making a dual-agency deal with their client rather than urging to find buyers who are able to contract at higher prices. However, in the case of an exclusive mediation agreement, where a fee will definitely be received from the seller's side, the broker have an incentive to generate a dual-agency deal by urging to sell to his or her client in less-than-one-week period prior to REINS registration. Moreover, in the case of an exclusive mediation agreement, there is a stronger binding force on broker's behavior such as the broker is the only company who can post advertisements of its real estate. Based on such a relationship, we have made two hypotheses: (1) companies with non-exclusive agreements find it easy to make a dual-agency deal and (2) companies with exclusive agreements find it easy to make a dual-agency deal.

We conducted a regression analysis with the commission level as the dependent variable and a dummy variable divided by the proportion of number of contracts in mediation into two groups of at least 75% or fewer than 75% for each of non-exclusive mediation agreement, exclusive mediation agreement, or privileged and exclusive mediation agreement as independent variables. The results are presented in Table 12.6. No significant relationship was evident for commission levels with any of non-exclusive mediation agreement, exclusive mediation agreement, or privileged and exclusive mediation agreement.

Table 12.6 Regression analysis from the dummy of 75% or more for each type of mediation agreement

	Coef.	S.E.
Intercept	0.045358	0.002399***
Dummy of non-exclusive mediation ($\geq$75% = 1, <75% = 0)	−0.005651	0.004095
Dummy of exclusive mediation ($\geq$75% = 1, <75% = 0)	−0.004940	0.003159
Dummy of privileged and exclusive mediation ($\geq$75% = 1, <75% = 0)	−0.005439	0.004073
R^2	0.03282	
Adjusted R^2	0.009035	
		N = 126

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

Table 12.7 Descriptive statistics for each variable by mediation commission level group

	Single agency	Partial dual agency	All dual agency
N	22	92	24
Mean of # of contracts	121.82	828.04	20.542
Mean of total contract amount (billion yen)	4.8323	33.597	0.33104
Mean of average contract amount (million yen/transaction)	31.877	29.944	19.054
Mean of commission level (%)	2.2192	4.0434	6.7393

12.5   Impact of Dual Agency on the Sale Price

To examine the impact of dual agency on the sale price, we conducted a regression analysis by separating respondents into a single-agency group with less than 3% trade mediation commission level, a partial dual-agency group with 3−6% commission level, and an all dual-agency group with 6% or more commission level, taking the dependent variable to be the average contract amount per transaction and independent variables being these group dummies (Table 12.7).

The results are presented in Table 8 (A). The partial dual-agency group dummy and the all dual-agency group dummy had negative significant effect. This corresponds to the weak negative correlation between the commission level and contract amount seen in Sect. 12.3.2. In addition, contract amount was significantly higher in major city areas. As with Sect. 12.4.1, a certain measurement error is included when using commission level as a proxy variable for dual agency, so we modified the model 2 in Table 12.8 (A), limiting to companies that set the fee at the upper limit. The results are presented in Table 12.8 (B). Although the significance of the dummy of location vanished and the dummy of 11 or more employees turned significant, the dummy for the partial dual-agency group and the dummy for the all dual-agency group remained the same.

Table 12.8 Regression analysis taking the average contract amount per transaction as the independent variable and the dummy of agency-type as the independent variables

| | (A) all companies (N=155) | | | | (B) set at the upper limit (N=138) | |
| | Model 1 | | Model 2 | | | |
	Coef.	S.E.	Coef.	S.E.	Coef.	S.E.
Intercept	53701313	8255161 ***	42861517	9185982 ***	28025462	6195147 ***
Dummy of agency-type						
Single agency	(baseline)	-	(baseline)	-	(baseline)	-
Partial dual agency	-23162140	9412332 *	-23562684	9354495 *	-1679069	6474398 *
All dual agency	-35090935	12244382 **	-33310281	12185069 **	-10562470	8045719 **
Dummy of # of employees						
1-5			(baseline)	-	(baseline)	-
6-10			6905144	7689762	-170333	4937501
11-			12149065	15414726	26614161	10049823 **
Dummy of location						
Major city area			15567036	7375346 *	3594507	4851356
Other area			(baseline)	-	(baseline)	-
R^2	0.05658		0.09767		0.0929	
Adjusted R^2	0.04417		0.06739		0.05854	

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

12.6   Conclusion and Future Issues

In the US, where disclosure concerning dual agency is obliged, there is no price difference evident between dual and single agency. However, in Japan, where *Kakoikomi* with dual agency is easier owing to more incomplete information, we show that 70% of companies are closing dual-agency deals, resulting in a lower sale price. In addition, the size of companies, the scale of the market, and the differences in the main types of mediation agreement are not necessarily the causes for increasing the matching probability of dual agency. The reduction of the sale price in dual agency suggests that brokers raise moral hazard in relation to sellers. To improve disadvantageous circumstances to sellers, initiatives are required such as a system for status monitoring where sellers can confirm the state or property transactions, that REINS has started.

Nevertheless, the dual-agency group dummy is merely an indirect indictor of dual agency, and one should be wary of accepting this conclusion at face value.

Further, there is an endogeneity problem in that the quality of property, which is not an observable variable, may possibly have an impact not only on sale price but also the choice of dual or single agency. The change in the significance of the dummy of employees and the dummy of location could also be attributed to the influence of the quality of property. However, variables that are independent of the quality of properties handled by such companies were not included in this survey; consequently, endogeneity cannot be verified. Nonetheless, at the very least, there is no denying the possible existence of endogeneity.

There are three points that could not be examined in our study. First is the ratio of buyer and seller mediation by each broker. Even if there are large numbers of customers, when there is a bias toward sellers or buyers, the matching probability of dual agency is considered not to increase. In addition, brokers that only handle buyers as customers are unable to propose a dual-agency deal in the first place. Second is the impact by dual agency on the number of days required for contract closing. Third, as our target list of questionnaire was not on the units of transactions but on the units of companies, we could not directly examine the impact of the different types of mediation agreement on mediation transactions, and it was also impossible to examine the impact of the attributes of the property such as size and facilities. These are all remained for future research.

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Chapter 13
A Study on the Relation Between Residential Land Value and the Distance to the Center of the Tokyo Metropolitan Area (1970–2016)

Kenichi Ueno

Abstract   The purpose of this paper is to investigate the relation between residential land value and the distance to the center of the Tokyo Metropolitan Area from 1970 to 2016. The result shows three trends in the relation: (1) residential land value had increased at all standard sites even while the interest rate was kept high; (2) when the interest rate has become lower, the shorter the distance to the center became, the higher residential land value has increased; and (3) recently the areas where residential land value fluctuate has become narrower. This paper discusses about these trends.

Keywords   Residential land value · The distance to the center · Tokyo Metropolitan Area · Gradient curve

13.1   Introduction

According to Ministry of Land, Infrastructure, Transport, and Tourism's publishment of value of standard sites, all use average of value of standard sites in Japan rose in 2016 after an interval of 8 years. Value of standards sites continued to increase since the first publishment in 1975 till the collapse of Japan's economic bubble in the 1990s. However, value of standard sites has increased only twice between 2008 and 2009 and this time after the collapse of bubble economy. Why did such a change happen? Whether in the central or in the suburban area of the Tokyo Metropolitan Area did value of standards sites increased? One of the methods to answer these questions is to investigate the relation between the distance to the

K. Ueno (✉)
Nihon University, Tokyo, Japan
e-mail: ken-u@ab.cyberhome.ne.jp

center of Tokyo and value of standard sites. The graph of this correlation is called "the land value gradient curve".

Looking at the preceding studies of land value gradient curve, Kasiwadani (1987) plotted the relation between the mean of value of standard sites and the mean time distance to the center of Tokyo on a chart to estimate the land value gradient curve using data calculated municipality by municipality in the Tokyo Metropolitan and Saitama prefecture, namely with the western part of the Tokyo Metropolitan Area. The gradients estimated by Kasiwadani were same between 1970, 1976, and 1985 except for gradients around the center of Tokyo in 1985. Nishimura (1990) said this study by Kasiwadani indicated land value was stable relatively until 1985.

Ando (1995) estimated the land value gradient curves using all the data of value of standard sites in residential and commercial areas in the Tokyo and the Osaka Metropolitan Areas, and analyzed the diffusion of sharp rise in land value from the city center to the suburbs during the bubble economy by analyzing changes in the land value gradient curve with focus on the time distance to the city center. Yamada (2010) set a sphere at each a distance of a kilometer from Tokyo Station of Japan Railway, estimated the relation between land value and the distance to Tokyo Station, and made the regression curve from 1991 to 2009, using the mean value of standard sites within each a sphere. By the curve, he indicated what extent of the functions of the Tokyo Metropolitan Area was put together. These proceeding studies clarified changes in the land gradient curve in a certain shorter period when the bubble occurred or collapsed, but little study has demonstrated how land value gradient curve has changed for the long period from 1970, when publishment of value of standard sites started, to now. The objective of this study is to simply examine whether changes in the land value gradient curve existed in the Tokyo Metropolitan Area over the time period from 1970 to now, and to examine changes in the residential land value by analyzing which factors caused such changes, if any.

13.2   Data and Results of Estimation

Some preceding studies contrived data handling of value of standard sites because the number of standard sites has increased from 970 in 1975 to 25,270 in 2016, and during the period, many standard sites were substituted by new sites as the land use patterns had changed. Therefore, we must investigate the relation between the distance to the center of Tokyo and the land value with data of a set of same sampling sites or sampling sites which are as close as possible with each other in order for the analysis not to be biased. We can use residential land standard sites with data of a set of sampling like this retroactively to 1975 but cannot use so commercial land standard sites. In this respect, this paper investigates residential land value, using commercial land value in relation to the influence to the residential land value gradient curve. Sampling sites is used from "examples of value of standard sites in residential area around the rail road station" (Refer to Appendix of p. 8), published by Ministry of Land, Infrastructure, Transport, and Tourism. The standard sites of these examples are around a distance of 1 km to the nearest railroad station, and

Table 13.1   Dummy variables

Value factor	Dummy variables
Availability of waterworks, gas service, and sewerage	A complete set: 1, not a complete set: 0
Building attribute	Detached: 0, Condominium: 1
Restricted zone	Category 1 or 2 low-rise exclusive residential restricts, from 1976 to 1994 Category 1 exclusive residential district, and in 1970 exclusive residential district: 0, the other: 1

many of them are detached houses in Category 1 low-rise exclusive residential districts, and even in the other respects, they are almost of same quality. We investigate land value at the same sites retroactively to 1975 but in case of re-selection of standard sites, we choose sampling sites which are as close as possible around 1 km to the station. In case of no station near the sites, we took it off the sampling sites, taking the influence to land value into considering.

   We conducted a multiple regression analysis by Hedonic approach to estimate the relation between the distance to the center of Tokyo and land value of the site. The center of Tokyo is set at the Ginza 4-chome cross with the highest land value in 2016. Explained variable (Y) of the estimated model is the residential land value. Table 13.1 shows Dummy variables.

   The estimated models are as follows:

$$\ln(Y) = \alpha + \beta1 \text{ (Distance to the center of Tokyo(km))}$$
$$+ \beta2 \text{ (Distance to the nearest station (km))} + \beta3 \text{ (site area (m}^2\text{))}$$
$$+ \beta4 \text{ (Width of the frontage road (m))}$$
$$+ \beta5 \text{ (Dummies such as the sower)} + \beta6 \text{ (Building attribute dummy)}$$
$$+ \beta7 \text{ (Restricted zone dummy)}$$

   Table 13.2 shows the results of estimation of 1970, 1976, and 1985, of which Kasiwadani (1987) showed "the land value gradient curve", 1988 and 1994, when the land value increased and decreased rapidly, and 2008, 2010, and 2016, when land value fluctuated much. The result shows that land value is strongly related to "distance to the center of Tokyo", "dummy valuables of availability of waterworks, gas service, and sewerage" in all observation years. Especially "distance to the center of Tokyo area" is significant at a 1% level. Land value is strongly related to "site area", "distance to the nearest station", and "building attribute" in almost all years.

   Consequently, if the site is at a distance of 1 km to the nearest station, with availability of waterworks, gas service, and sewerage, in Category 1, 2 low-rise exclusive residential districts, the site area is 200 m^2 and the width of the frontage road is 6 m, the relation between natural logarithm of land value (Y) and the distance to the center of Tokyo (X) is estimated as the relational expression of each year. For example, we obtain the relational expression of 2016:

Table 13.2 Results of estimation

	2016	2010	2008	1994	1988	1985	1976	1970
Constant term	12.86*** (0.26)	12.87*** (0.26)	13.10*** (0.26)	13.18*** (0.17)	14.02*** (0.26)	12.84*** (0.15)	11.80*** (0.15)	11.34*** (0.14)
Distance to the urban center	−0.033*** (0.003)	−0.033*** (0.003)	−0.034*** (0.003)	−0.023*** (0.002)	−0.038*** (0.004)	−0.026*** (0.002)	−0.026*** (0.002)	−0.030*** (0.003)
Distance to the nearest station	−0.430*** (0.166)	−0.406*** (0.150)	−0.458*** (0.146)	−0.225** (0.094)	−0.289** (0.135)	−0.104 (0.08)	−0.078 (0.054)	−0.044** (0.066)
Sites area	0.001*** (0.001)	0.002*** (0.001)	0.002*** (0.001)	0.002*** (0.001)	0.016*** (0.001)	0.001*** (0.001)	0 (0.001)	0.001** (0.001)
Width of the frontage road	0.038 (0.031)	0.008 (0.029)	0.011 (0.03)	0.003 (0.022)	−0.001 (0.029)	0.002 (0.017)	0.040** (0.02)	−0.006 (0.017)
Water service, gas service, and sewerage	0.565*** (0.165)	0.471*** (0.150)	0.466*** (0.152)	0.143** (0.061)	0.336*** (0.091)	0.216*** (0.054)	0.285*** (0.064)	0.262*** (0.074)
Building attribute	0.231 (0.176)	0.326** (0.144)	0.381*** (0.145)	0.316** (0.143)	–	–	–	–
Restricted zone	−0.127* (0.076)	−0.065 (0.071)	−0.129* (0.071)	0.059 (0.054)	−0.324 (0.329)	0.108 (0.265)	−0.020 (0.057)	−0.181** (0.078)
Adjusted R-squares	0.73	0.74	0.76	0.76	0.73	0.78	0.76	0.76
Prob (F-Statistics)	0	0	0	0	0	0	0	0
Sample size	129	129	129	121	121	114	111	69

Notes. Standard errors are given in parentheses ***, **, * are 1%, 5%, and 10% significance level each

$$\ln{(Y)} = 13.36 - 0.033X \tag{13.1}$$

I convert it into an exponential function and make the graph to become plain visually.

13.3   Chronological Changes of Land Value Gradient Curves

I make the relational expression (13.1) in the previous section the graph and explain about the chronological changes of the gradient curves, using the economic indicators which have generally a strong influence to land value.

Figure 13.2 shows the gradient curves of 1970, 1976, and 1985 within 50 km area to the center of Tokyo. The vertical axis of Fig. 13.2 is logarithmic scale like the graph of Kasiwadani. The gradient curves in Fig. 13.2 rise parallel just like Fig. 13.1, except the difference that the horizontal axis of Fig. 13.1 is the time distance, but the axis of Fig. 13.2 is the distance to the center of Tokyo. The interest rate: 10-year government bonds interest rate had been about 8% until 1983 and then began to decrease and became 6.6% in 1985. As Table 13.3 indicates, in the meanwhile the increased rate of residential land value was higher than the rate of the commercial
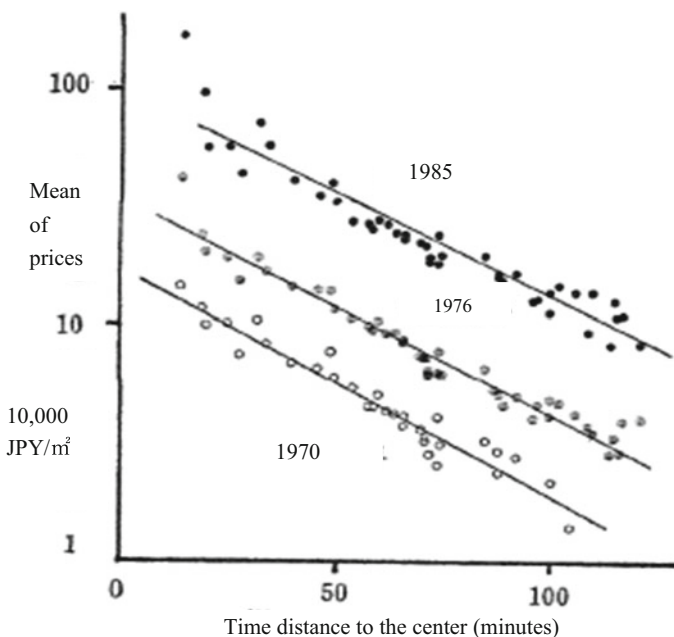
Fig. 13.1 The gradient curve in the west of Tokyo from Kasiwadani (1987)

Fig. 13.2 Changes of the
gradient curve (1970, 1976,
and 1985)
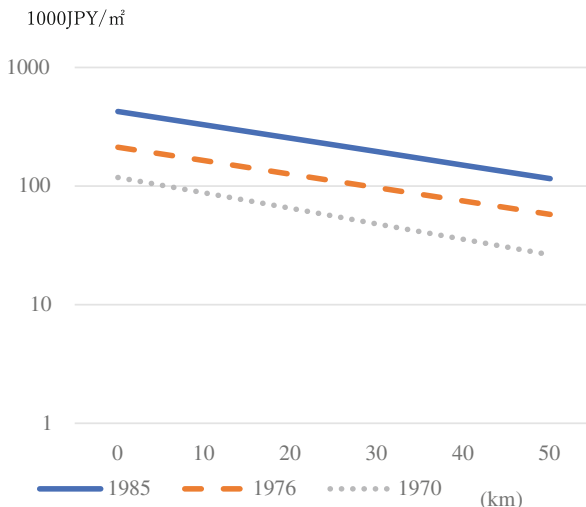
Table 13.3 Changes of Land value, GDP, and wages indexation (1970 = 100)

Year	Residential land price	Commercial land price	GDP	Wages index
1970	100	100	100	100
1976	226	165	227	265
1985	406	262	444	414
1988	856	703	519	449
1994	699	487	676	528
2008	440	204	668	518
2010	400	178	655	497
2016	391	180	682	–

land value. The mean residential land value in the Tokyo Metropolitan Area, GDP, and the index of wages increased in 1976 and 1985 at the same ratio as a basis of 1970. This indicates income increase influenced to the increase of the residential land value.

Next, I estimate the gradient curve of 1988 before the collapse of Japan's economic bubble, and 1994 and 2008 after the collapse. I make the vertical axis a normal scale in order to show the land value was remarkably high in the bubble. Looking at Fig. 13.3, land value decreases as much as it becomes nearer to the center from 1988 through 1994. Land value of 1994 is less than half land value of 1988 around a distance of 10 km to the center. On the other hand, the gradient curves of 1988 and 1994 are adjacent to each other around a distance of 50 km from the center, because value of sites around a distance of 50 km increased or didn't. After 1994, land value continued to decline for more than 10 years. Figure 13.3 also shows that the gradient curve in 2008 is falling down as much as it becomes far from the center,

Fig. 13.3 Changes gradient curves (1988, 1994, and 2008)
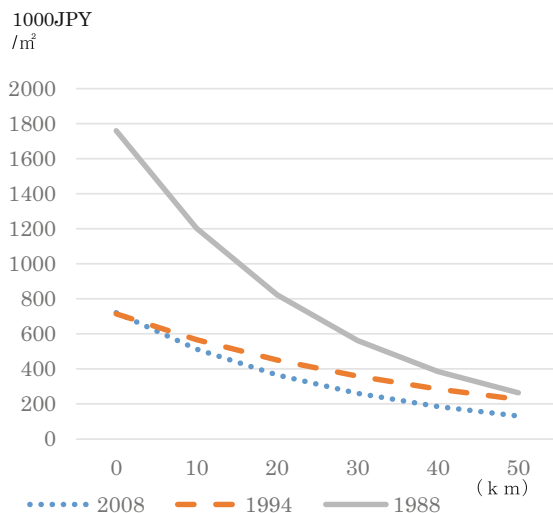
and this indicates land value decreased throughout the Tokyo Metropolitan Area from 1994 to 2008.

The long-term interest rate began to drop since the latter half of 1980s: the rate was 4.9% in 1988 and 3.3% in 1994. Table 13.3 shows that land value rose much more largely than GDP and Wages index from 1985 through 1988. Commercial land value increased much higher than residential land value during the same period, contrary to from 1970 through 1985. This situation continued until 1991.

The sharp drop of the interest rate since the latter half of the 1980s stimulated the demand for commercial land greatly, and as a result, land value increased highest at the center of the Tokyo Metropolitan Area and then expanded to the surrounding areas. Because the demand for residential land value was still strong, the shorter the distance to the center became, the higher residential land value has increased, with the increase of commercial land value. In the decrease situation, the shorter the distance to the center of Tokyo became, the more residential land value decreased. Land value increased in the center of Tokyo, and after then the increase extended throughout the Tokyo Metropolitan Area, because residential areas were newly developed even at a distance of more than 50 km to the center.

Judging from the gradient curves of 1988 and 1994, the shorter the distance to the center of Tokyo became, the more sharply residential land value decreased. Judging from the gradient curves of 1994 and 2008, residential land value decreased throughout the Tokyo Metropolitan Area, though changes of gradient curves during the period are not plotted. Figure 13.4 plotted the gradient curves of 2008, 2010, and 2016. Lehman Shock in 2010 caused residential land value to decrease sharply. The gradient curve moved counterclockwise from 2008 to 2010, and this means residential land value decreased as much as it was near to the center of Tokyo. But the extent of these changes of Fig. 13.4 is much smaller than Fig. 13.3. The gradient curve of 2016 is located between the curves of 2008 and 2010. This means that residential

Fig. 13.4 Changes of the
gradient curve (2008, 2010,
and 2016)
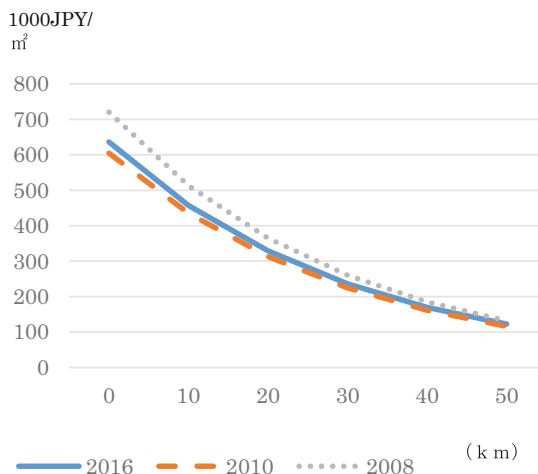
land value of standards sites of 2016 publishment had the upward trend, but didn't
recover to the level of 2008.

In 2006, the economic expansion continued for 4 years and forth month and
consequently exceeded the bubble economy period which was the longest until then,
and the interest rate of ten-year national debt dropped by 2%. In the economy
expansion period, land value increased in 2007 and 2008. Like the state of the late
1980s, strong demands for commercial areas near the center of Tokyo area raised
commercial land rent. Rent increase also caused the increase of residential land
value. After the Lehman shock happened, demands for land dropped and land value
decreased immediately. The latest increase of land value occurred mainly in the
commercial areas, because the land demand was restored in the commercial areas
around the center of Tokyo by the quantitative easing by the Bank of Japan. On the
other hand, the increase of residential land value was not so large, because incomes
decreased by the influence of a consumption tax increase.

It is evident from the above-mentioned consideration that changes of land value
gradient curves have the next three patterns.

1. Though the interest rate was kept high, gradient curves of residential land value
   shift upward as a whole. In other words, for some period land value of all
   sampling sites increased.
2. When the interest rate has become lower, the shorter the distance to the center
   became, the higher residential land value has increased.
3. In these past 10 years, changes of land gradient curves became smaller. The
   shorter the distance to the center became, the higher residential land value has
   increased, but the areas where residential land value fluctuated have become
   narrower.

I discuss (3) from (1) further in the next chapter.

Fig. 13.5 The bit price at X0 spot when income increases
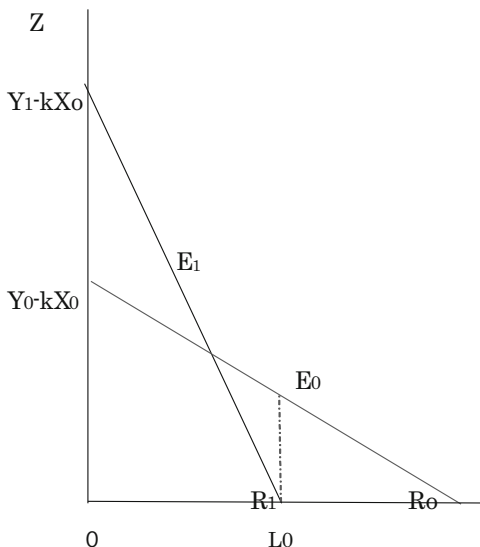
13.4 Why Do Gradient Curves Change?

(1) Wheaton ([1973](#)) developed a concentric ring model by Alonso into a general equilibrium model and got the theoretical conclusion about the relation between land rent and the distance to the city center. The premises of the model are as follows. Consumer goods are produced in the city center. Wage, price, and consumer goods cost are given exogenously. Employees working in the city center have same income and utility. There is a trade-off between land rent and the distance to the city center. In the closedown city, population scale is decided endogenously, while in the open city, utility level is given exogenously and population scale is decided endogenously. A landowner is a local monopolist and rents land to the person who bits the highest rent per one-unit area by auction.

The conclusion of the model is that income increase and a drop of traffic cost cause the border to enlarge in the closedown city and to lower rent as much as it is near the city center. The slope of the rent gradient curve is gentler according to the distance to the city center. On the contrary, in the open city, rent increases at all spots. I explain the case of open city briefly with reference to Nakagawa ([2008](#)). Looking at Fig. [13.5](#), all inhabitants are assumed to rent land of lot size L in each spot of the city and to consume synthetic goods Z. We maximize a utility function $U(Z, L)$ under a budget linear function: $Y = Z + R0L + kX0$, assuming transportation expenses to the $X0$ spot as $kX0$. Because population flows in the open city and utility level is decided exogenously, the income increase ($Y0 \rightarrow Y1$) brings rent increase ($R0 \rightarrow R1$), as described in Fig. [13.5](#). This rent increase in all spots resulted in moving above the rent gradient curve as Fig. [13.6](#) indicates.

Fig. 13.6 The rent gradient
curve when income
increases
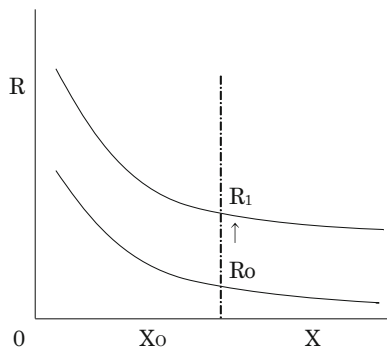
Next, I consider the relation between rent and land. The model above is built upon the assumption that a landowner, who monopolizes land in the region, does not sell but lent land by auction. This model assumes that the interest rate does not fluctuate, in that the model doesn't use the interest rate as variables. When in each spot rent is determined by auction, a landowner is supposed to calculate land value. I write land value P, rent R, the interest rate i, and the increase rate of rent θ. During all periods, i and θ are constant. If land value is equivalent to discount present worth of the profit that land will produce in the future,

$$P = R/(i - \theta)$$

In each spot $\triangle P/P = \triangle R/R$, and as a result, the land value gradient is equivalent to the rent gradient.

From 1965 through 1985, the Tokyo Metropolitan Area continued to enlarge by chronic shortage of house stock since the World War II and population inflow from the other areas. Until about 1985 the interest rate was fixed as the high level. These society economic conditions are similar to the assumption of the model above. One of the results obtained from the model, "In the open city income increase brings rent to increase at all spots", explains well that the index of wages and residential land value are about same until 1985 if the level of 1970 is 100, as Table 13.3 shows, and land value increased at the similar rate in all sampling spots; in other word, the gradient curve moves parallel at the upper right.

(2) The model above can't explain the movement that when the interest rate has become lower, the shorter the distance to the center became, gradients of the residential land value curve has become bigger, namely the higher residential land value has increased. Lowering of the interest rate enhanced demand for commercial land and increased discount present worth of the profit and consequently influenced residential land value. It appears in that commercial land value became much bigger than residential land value at the increase rate from 1985 to 1988 as Table 13.3 shows.
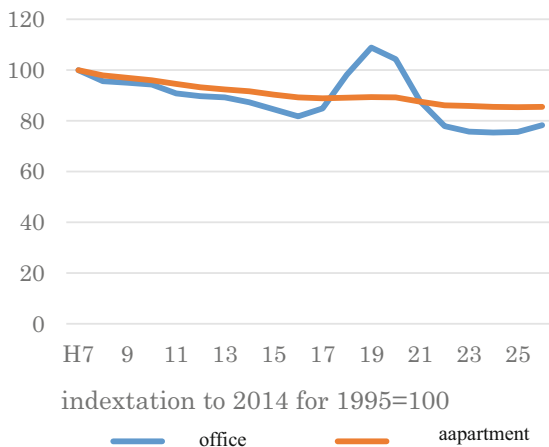
Note: H7 is 1995 and 25 is 2013.

The model of Wheaton assumes that production place is located at the center of a concentric circle and doesn't influence residential land rent. But if a drop of the interest rate enlarges the area of the center of the concentric circle, it consequently influences residential land value. According to Tomita (2015), the floor space of office changed from 1321 hectare of 1972–3589 hectare of 1995, of which 1076 hectare increased from 1982 to 1992. The increase of these spaces greatly exceeds the other uses and the other regionals. In addition, according to the investigation for condominiums in the three special wards of Tokyo Metropolitan, it is reported that about half of dwelling units were converted into non-house uses such as offices by house number ratio.

It is generally said that land value increase from the latter half of 1980s through 1991 was caused by the occurring of the economic bubble. During the period, there were two factors to increase residential land value. The first factor is that income increase and population flow since some time before 1985 made the gradient curve to move above. The second is that commercial rent increase by a drop of interest rate had some influence to residential land value.

In the decrease situation, the gradient curve fell down as much as it was near to the center and afterward all spots fell down gently. The sharp drop of commercial land value of the center of the Tokyo Metropolitan Area is the factor of the first decrease. The one cause of the gentle decrease in all spots since 1994 is that income had the tendency to decrease every year.

(3) The common change between twice land value increases for these past ten years is that the shorter the distance to the center of Tokyo became, the more land value changed, and on the other hand, land value didn't increase in the sphere far from the center of the Tokyo Metropolitan Area. One factor of this change is that land rent has a tendency to decrease. Because we cannot observe land rent by data, but, alternatively, we use rent of office and apartment.

Looking at Fig. 13.7, office rent increased around 2006 and 2007, then turned to decrease, and increased again in 2013. On the other hand, apartment rent continues to decrease since 1995. Apartment rent excluding imputed rent of Consumer Price Index has decreased since 1997 in Kanto Region, namely almost the Tokyo Metropolitan Area. According to Basic Resident Register of these days, the past 3- or 4-year population tends to flow out in the sphere from 30 to 40 km of Tokyo metropolitan area.

Wheaton model assumes that in the open city population flows into suburbs until utility of inhabitants becomes same. Because recently the Tokyo Metropolitan Area population tends to flow out from the suburbs. The residential land value gradient curve tends to shift downward around the suburbs. As a result, land value of the residential area changed only near to the downtown area.

13.5   Conclusion

This paper finds two movements of the residential land gradient curve; the one is to shift upward as a whole because of a lack of residential land by population inflow and the increase of income, and the other is to shift upward near the center of the Tokyo Metropolitan Area by strong demand for the commercial area under the drop of the interest rate and the expansion of economic activities. In these past 10 years, apartment rent tends to decrease and house residential rent tends to shift downward as much as it becomes far from the center of the Tokyo Metropolitan Area. As a result, the increase of commercial land value by stronger demand for the commercial land around the center had some influence to the narrower sphere of the residential land. Land value of the residential area that is near to the center of the Tokyo Metropolitan Area increased recently, but if the commercial areas demand and the rent of office decreased in the economic recession situation, land value of the residential area would decrease.

The limitation of this paper is that we don't analyze the value forces of commercial land which influences residential land value. Value forces of commercial land have been made by the profit reduction price method, as securitization of the real estate has penetrated. It can be presumed that some factors except an interest rate let commercial land value change under an ultra-low interest in recent years. In future, it is critical to study further in what time commercial land value increases or decreases with a full understanding of exiting studies.

Appendix: Examples of Published Value of Standard Sites in Residential Area Around the Railroad Station in 2016

The vicinity of railroad	Standard site number
10 km range	Minato-2, Tiyoda-3, Sinjuku-6, Taitou-1, Bunkyo-5, Shibuya-5, Shibuya-7, Sinagawa-11, Megro-9, Setagaya-5, Nakano-1, Toshima-15, Kita-9, Katushika-17
Keihin Express Line	Ota-3, Kounan-1, Yokohamakanazawa-11, Yoko-suka-37
Yokosuka Line	Hodogaya-1, Kamakura-25, Zushi-7, Yokosuka-37
Keihin Tohoku Line, Nanbu Line	Ota-10, Yokohamaturumi-21, Kou-8
Tokaido Line	Yokohamanishi-5, Totsuka-12, Kamakura-15, Fujisawa-46, Hiratuka-24
Yokohama line, Soutetsu Line, Negishi Line	Yokohamamidori-3, Yokohamaasahi-1, Yokohamanaka-6, Isogo-8
Touyoko line, DenenToshi Line	Ota-30, Kouhoku-12, Kouhoku-34, Setagaya-59, Yokohamaaso-19, Yamato-9, Yokohamaaoba-12, Yokohamamidori-15,
Odakyu line, Odakyu Enoshima Line, Keiou line	Setagaya-39, Asou-29, Machida-19, Sagamiminami-4, Atsugi-20, Isehara-7, Yamato-6, Fujisawa-34, Setaga-1, Tyoufu-2, Tokyofutyu-2, Tama-6, Hino-24
Chuo Line, Musashino Line	Suginami-9, Musashino-14, Kokubunji-7, Kunitachi-10, Tachikawa-6, HIno-25, Hachioji-66, Hachioji-73, Yoshikawa-3, Saitama-9, Niiza-14
Oume Line, Itukaichi Line	Akishima-12, Oume-8, Akiruno-4
Seibu Sinjuku Line, Seibu Ikebukuro Line	Suginami-27, Nishitokyo-8, Kodaira-3, Sayama-12, Nerima-25, Nishitokyo-22, Kiyose-6, Tokorozawa-36, Iruma-3, Hannou-1
Tobu Tojo Line, Tobu Isesaki Line, Toubu Noda Line	Itabashi-4, Wakou-4, Shigi-2, Fujimino-6, Kawagoe-1, Sakato-2, Higashimatuyama-3, Adachi-39, Koshi-gaya-14, Kasukabe-12, Sugito-4, Nagareyama-10
Tskuba Express Line	Yashio-10, Nagareyama-14, Kasiwa-55, Moriya-3
Touhoku Line, Takasaki Line	Kawaguchi-45, Urawa-8, Omiya-9, Hasuta-8, Kuki-2, Ageo-12, Okegawa-5, Kounosu-8, Kounosu-15
Joban Line, Kantorailway, Joso Line	Adachi-3, Matsdo-1, Matsudo-42, Kasiwa-2, Abiko-17, Toride-29, Toride-13, Ushiku-1, Jousou-7
Soubu Line, Sotobo Line, Uchibo Line, Keiyo Line, Keisei Honsen Line	Ichikawa-6, Funabashi-45, Funabashi-10, Tibatyuo-13, Tibamidori-5, Ichihara-26, Ichihara-3, Kisarazu-5, Kimitu-5, Urayasu-12, Mihama-3, Yachiyo-5, Sakura-5, Sakura-7, Narita-11

[129 spots]

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Chapter 14
Study on Premium Rent of Refurbished Apartments Based on Bayesian Modeling Using Stated Preference Data of the Tenants

Hiroaki Komatsu

Abstract In this study, we evaluated the premium rent of refurbished apartment houses in Greater Tokyo. We found that as a residential building's age increased, the premium rent decreased. Male tenants in the age group of 20–30 years showed the highest willingness to pay (WTP). In addition, a high degree of residential satisfaction and the sense of expense toward rent had negative effects on the WTP toward premium rent.

14.1 Introduction

14.1.1 Background to the Research

The Basic Plan for Housing, formulated in March 2016, indicates a new direction for housing based on the recognition that there have been delays in conversion of the market, from being primarily a market for newly constructed housing to a market that applies to existing homes. One recorded indicator of specific outcomes is the expansion of the scale of the Refurbishment Market from 7 trillion yen (2013) to 12 trillion yen (2025). There are expectations that the market flow for existing homes will be promoted through refurbishment.

Nevertheless, looking at the refurbishment ratio in recent years, although the figures are limited to owner-occupied residences, the refurbishment ratio (annual average) for apartments has stayed at a low level of 4.5%. Looking at apartments within rented houses, one reason for the lack of progress in refurbishment work is the lack of expectations for increased rent or occupancy rates following such work

H. Komatsu (✉)
Meikai University, Urayasu, Japan
e-mail: hiro-komatsu@meikai.ac.jp

(Komatsu and Chau 2015). Grasping the impact of refurbishment work on rent is vital to estimate the profitability of investment in such work and for appropriate decision-making.

14.1.2 Purpose of the Research

This research aims to consider the degree of impact that refurbishment work for rental apartments in the Tokyo Metropolitan Area has on rent, based on a quality assessment of such work and taking the degree of change as a rental premium.

Note that the rental premium in this research is defined to be the amount of increase in rent that is thought to be the maximum payment that a lessee would consider acceptable to pay following refurbishment work on the same dwelling.

14.1.3 Previous Research

Much of the previous research concerning refurbishment has been on the state of such refurbishment (Cho and Takada 2015; Takagi et al. 2002).

However, there is a limited amount of research discussing the impact that refurbishment work has on housing prices. One reason is the lack of information arranged in a way that relates price information on housing to the repair history information. Research that discusses the impact that refurbishment work has on housing prices includes, for example, Iwata and Yamaga (2008) and Harano et al. (2012), but these both look at refurbishment work on owner-occupied dwellings.

There has been insufficient research to date concerning the impact on rent from the perspective of a lessee who is the beneficiary of refurbishment work on rented houses.

14.2 Research Method

14.2.1 Analytical Method

First is to construct a model for a quality assessment of refurbishment work by rental residents. Specifically, an evaluation using the state of functional sufficiency as a rental apartment and the satisfaction levels of such residents is adopted. This is aimed at rigorously accentuating in advance the contribution of the refurbishment work which increases the utility of residents and at giving an interpretation to the monetary evaluation referred to below. Next, to clarify the resident attributes and dwelling attributes that have an impact on such evaluation, multinomial probit models are estimated. Such models are estimated with 18 types of refurbishment

Table 14.1 Status of implementation of questionnaire

	Tenants of rental condominiums and apartments
	Residences: special wards of Tokyo, Yokohama City, Saitama City, and Chiba City
Survey subject	Age: 20s–50s
Number of responses	Total number of responses: 4500 Special wards of Tokyo: 2000 (1000 males, 1000 females) Yokohama City: 1500 (750 males, 750 females) Saitama City: 600 (300 males, 300 females) Chiba City: 400 (200 males, 200 females)
Survey method	Web questionnaire (Survey subcontractor: Rakuten Research, Inc.)
Survey period	February 12 (Fri)–February 26 (Fri), 2016
Main content of survey	1. Tenants' thoughts on the architectural age of their units 2. Qualitative rating on reform work 3. Computation of rental premiums and rental discounts

work. Furthermore, to estimate the rental premium for the dwelling after such refurbishment work based on these factors, the tobit model with the target objective variable of the rate of the willingness to pay to the rent level is estimated as the Bayes model. Finally, a simulation of the rental premium after the refurbishment work using such model was conducted, grasping the differences in willingness to pay with the categories according to gender and age of lessee.

The data used in the above analysis was collected via a questionnaire survey of lessees of residences in rental condominiums and apartments in the Tokyo Metropolitan Area, which is compiled as stated preference data concerning refurbishment work (see Table 14.1).

14.2.2   Data Used

A questionnaire survey was conducted with lessees aged in their 20s to 50s at the time of survey dwelling in rental condominiums and apartments in the Tokyo Special Wards, Yokohama City, Saitama City, and Chiba City with 4500 valid responses received (see Table 14.1). As stated preference data, the information was respectively compiled for preference for refurbishment, amount willing to pay, residents' attributes, and building/dwelling attributes.

The basic statistics are as follows (see Table 14.2).

Table 14.2 Basic statistics

Variables		Tokyo's 23 wards	Yokohama City	Saitama City	Chiba City
Females dummy (yes = 1)	Mean	0.50	0.50	0.50	0.50
	Std. dev.	0.50	0.50	0.50	0.50
Age of household head	Mean	41.80	41.17	40.88	40.48
	Std. dev.	8.25	8.79	8.59	8.93
Annual household income (in a million JPY)	Mean	569.80	564.30	564.00	547.20
	Std. dev.	335.91	305.81	297.80	287.84
Rent	Mean	102,173	90,710	83,125	77,213
	Std. dev.	38182.09	31093.79	28255.21	29232.75
Floor area	Mean	39.91	45.04	46.12	47.26
	Std. dev.	17.76	18.66	18.37	19.21
Residential spell (in years)	Mean	6.61	6.15	5.79	6.30
	Std. dev.	5.94	5.91	5.51	6.29
Architectural age	Mean	21.78	20.96	19.65	22.16
	Std. dev.	12.68	12.05	11.53	13.23
Wood structure dummy (yes = 1)	Mean	0.12	0.16	0.11	0.13
	Std. dev.	0.33	0.36	0.32	0.34
Japanese style rooms dummy (yes = 1)	Mean	0.34	0.50	0.53	0.53
	Std. dev.	0.47	0.50	0.50	0.50
Auto lock system dummy (yes = 1)	Mean	0.37	0.23	0.24	0.18
	Std. dev.	0.48	0.42	0.42	0.38
Separated bathroom and lavatory (yes = 1)	Mean	0.82	0.90	0.92	0.96
	Std. dev.	0.38	0.30	0.27	0.21
Balcony dummy (yes = 1)	Mean	0.79	0.80	0.81	0.83
	Std. dev.	0.41	0.40	0.39	0.38
Number of observations		2000	1500	600	400

14.3   Categories Based on the Quality Assessment of the Refurbishment Work by the Lessee

14.3.1   Setting Types of Relevant Refurbishment Work

In this study, the refurbishment work is separated into three categories: indoor work, equipment work, and external work looking at the following total 18 works by type (see Table 14.3).

14.4   Setting the Quality Assessment of Refurbishment Work

The level of satisfaction (utility) of resident needs to increase to generate a rental premium because it is taken as a conversion of change in utility unit to currency unit.

So a quality assessment of the refurbishment work was conducted focusing on the relationship between the details of the refurbishment work and the degree of satisfaction of residents. For example, Kano et al. (1984) propose categories using the state of physical sufficiency and the degree of user satisfaction as quality factors for the product.

Table 14.3 Relevant refurbishment work

Classification	Work descriptions
Indoor works • Appearance • Sound insulation • Space	Replacement of flooring
	Renewal of wooden fixtures (e.g., door and fusuma)
	Sound insulation work with the floor/ceiling (doubling)
	Sound insulation work with additional wall layers (doubling)
	Doubling of sash
	Elimination of floor steps
	Expansion of storage space
	Modification of room layout
	Modification of the Japanese-style rooms to Western style
Facility work	Conversion of the kitchen to a system kitchen
	Conversion of the washstand to a dresser washstand (fitted with three mirrors)
	Modification of the toilet to a Western-style toilet (fitted with a washlet)
	Conversion of the current bath tub to a large one (with reheating function)
	Installation of an intercom with television monitor
Outdoor works	Appearance enhancement by painting the exterior walls
	Appearance enhancement by painting the roof
	Renewal of the entrance door
	Maintenance of the balcony

Table 14.4 Categories of quality assessment of refurbishment work

Classification of qualitative rating	Definition
Attractive rating	Rating for which the reform work provides satisfaction when it is performed and does not arouse discontent even when not performed
Unitary rating	Rating for which the reform work provides satisfaction when it is performed but arouses discontent when not performed
Must-be rating	Rating for which the reform work is taken as a common thing when performed but arouses discontent when not performed
Unconcerned rating	Rating for which the reform work neither gives satisfaction nor arouses discontent regardless of whether it is performed
Fulfilled rating	Rating for which the reform work is not needed from the beginning as there has already been satisfaction
Contrary rating	Rating for which the reform work arouses discontent when it is performed but gives satisfaction when not performed
Resigned rating	Rating for which the reform work is considered as a common thing when it is performed and does not arouse discontent even when not performed

In this research, reference is given to the categories of Kano et al. (1984), using the state of functional sufficiency of the building and the degree of residents' (lessees') satisfaction to assess the quality of the refurbishment work with the evaluation[1] of the refurbishment work by the lessee based on the following seven categories (see Table 14.4).

14.5   Attribute Analysis of Lessees Pertaining to the Quality Assessment of the Refurbishment Work

14.5.1   Investigating the Model

We will analyze the factors that affect the lessees' evaluation of a total of 18 types of refurbishment work based on seven categories of evaluation categorized in the preceding paragraph. The multinomial probit model is used when conducting such analysis. This was because an investigation by the multinomial logit model was done beforehand, but the null hypothesis was dismissed as the result of the inspection concerning independence of irrelevant alternatives (IIA).

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[1]The questionnaire survey was designed to grasp the relationship between the state of functional sufficiency of the building and the degree of residents' satisfaction by asking the question "How do you feel when refurbishment and/or renovation work is done?" with four options for the response: "like," "feels natural," "don't feel anything," and "it was not necessary." In addition, a separate question asked, "How do you feel when refurbishment and/or renovation work is not done?" with four options for the response: "don't like," "can't be helped," "don't feel anything," and "it was not necessary."

The objective variables (Rji) are the seven categories of evaluation for each of the 18 types of refurbishment work, namely, "evaluation as attractive," "unified evaluation," "evaluation as obvious," "indifferent evaluation," "evaluation as already sufficient," "reverse evaluation," and "evaluation of resignation." The independent variables (Xi) include the residents' attributes and the dwelling attributes. This is formularized as follows. Note the estimated number of parameters totals 1728. In addition, Bayesian estimates are used to estimate each parameter.

Multinomial probit model uses the "evaluation as attractive" as a base and makes 18 estimates for each type of refurbishment work.

$$R^*i = \begin{cases} 6(\text{Resigned Rating}) \; if \; R6i = \text{Max}(R1i, R2i, R3i, R4i, R5i, R6i) \\ 5(\text{Contrary Rating}) \; if \; R5i = \text{Max}(R1i, R2i, R3i, R4i, R5i, R6i) \\ 4(\text{Fulfilled Rating}) \; if \; R4i = \text{Max}(R1i, R2i, R3i, R4i, R5i, R6i) \\ 3(\text{Unconcerned Rating}) \; if \; R3i = \text{Max}(R1i, R2i, \; R3i, R4i, R5i, R6i) \\ 2(\text{Must} - \text{Be Rating}) \; if \; R2i = \text{Max}(R1i, R2i, R3i, R4i, R5i, R6i) \\ 1(\text{Unitary Rating}) \; if \; R1i = \text{Max}(R1i, R2i, R3i, R4i, R5i, R6i) \\ 0(\text{Attractive Rating}) \; if \; R0i = \text{Max}(R1i, R2i, R3i, R4i, R5i, R6i). \end{cases}$$

Note that $Rji = \alpha + \beta jXi + ui$

14.5.2 Model Estimation Results

Overall Evaluation Features of the Refurbishment Work Viewed by Gender and by Age

Based on the results of the Bayesian estimates from the multinomial probit model (see Table 14.5), we first grasp the points of difference in the evaluation of the refurbishment work focusing on the gender and age of residents (see Table 14.6).

Note that only age and the intersection between age and gender from the parameters estimated by the Bayesian estimate are listed in Table 14.5.

Focusing on the selection probability (odds ratio) for each type of evaluation in relation to the selection probability of the "evaluation as attractive," 1 was taken to be the basis and split into below a multiple of 1.0 and above a multiple of 1.0, with the number of evaluations aggregated, respectively.

Looking at females, it is observed that the number of evaluations with a multiple of 1 and above (a tendency for this evaluation to be selected) for the selection probability ratio for each type of evaluation relative to the selection probability of "evaluation as attractive" was the majority for each age group (see Table 14.6). This indicates that the refurbishment work is not necessarily recognized as an evaluation as attractive that increases the level of satisfaction. Specifically, for the "evaluation

Table 14.5 Estimation results of the multinomial probit model (only listing matters that intersect between age and gender based on the Bayesian estimation): tenants in the age group of 30s

Work descriptions	Estimation	Tenants in the age group of 30s					
		Unitary rating	Must-be rating	Unconcerned rating	Fulfilled rating	Contrary rating	Resigned rating
Replacement of flooring	Exp (mean)	0.931	0.573	0.786	0.919	0.945	0.753
	Mean	−0.072	−0.557	−0.241	−0.084	−0.057	−0.283
	Std. dev.	0.180	0.301	0.298	0.141	0.266	0.282
	2.5%	−0.475	−1.127	−0.847	−0.416	−0.714	−0.791
	97.5%	0.219	−0.056	0.213	0.166	0.492	0.344
Renewal of wooden fixtures	Exp (mean)	1.003	0.692	0.467	1.029	1.104	0.935
	Mean	0.003	−0.369	−0.761	0.029	0.099	−0.067
	Std. dev.	0.101	0.322	0.243	0.088	0.259	0.157
	2.5%	−0.296	−0.923	−1.229	−0.177	−0.271	−0.433
	97.5%	0.141	0.281	−0.281	0.254	0.908	0.214
Sound insulation work with the floor/ceiling	Exp (mean)	1.108	0.584	0.925	1.022	1.007	0.975
	Mean	0.103	−0.537	−0.078	0.022	0.007	−0.025
	Std. dev.	0.234	0.376	0.133	0.099	0.120	0.117
	2.5%	−0.342	−1.482	−0.453	−0.201	−0.285	−0.351
	97.5%	0.598	−0.039	0.006	0.272	0.307	0.202
Sound insulation work with additional wall layers	Exp (mean)	1.143	0.860	0.666	1.038	1.051	0.874
	Mean	0.134	−0.151	−0.407	0.037	0.050	−0.135
	Std. dev.	0.162	0.131	0.259	0.139	0.144	0.197
	2.5%	−0.148	−0.485	−0.975	−0.180	−0.193	−0.631
	97.5%	0.503	0.005	0.050	0.446	0.420	0.103

Doubling of sash	Exp (mean)	0.938	0.952	0.616	1.094	0.989	0.964
	Mean	−0.064	−0.050	−0.484	0.090	−0.011	−0.037
	Std. dev.	0.118	0.085	0.233	0.250	0.130	0.104
	2.5%	−0.299	−0.305	−0.957	−0.406	−0.296	−0.293
	97.5%	0.182	0.034	−0.053	0.564	0.323	0.189
Elimination of floor steps	Exp (mean)	1.108	0.584	0.925	1.022	1.007	0.975
	Mean	0.103	−0.537	−0.078	0.022	0.007	−0.025
	Std. dev.	0.234	0.376	0.133	0.099	0.120	0.117
	2.5%	−0.342	−1.482	−0.453	−0.201	−0.285	−0.351
	97.5%	0.598	−0.039	0.006	0.272	0.307	0.202
Expansion of storage space	Exp (mean)	0.744	0.994	0.914	0.957	0.805	0.972
	Mean	−0.296	−0.007	−0.090	−0.044	−0.217	−0.029
	Std. dev.	0.218	0.125	0.136	0.092	0.400	0.153
	2.5%	−0.739	−0.280	−0.455	−0.283	−1.000	−0.400
	97.5%	0.014	0.329	0.032	0.109	0.487	0.285
Modification of Room layout	Exp (mean)	0.598	0.860	0.912	1.054	0.934	0.815
	Mean	−0.514	−0.151	−0.092	0.052	−0.068	−0.205
	Std. dev.	0.460	0.182	0.124	0.240	0.176	0.223
	2.5%	−1.127	−0.598	−0.432	−0.407	−0.503	−0.760
	97.5%	0.554	0.033	0.048	0.518	0.326	0.003
Modification of the Japanese-style rooms to Western style	Exp (mean)	0.651	0.777	0.916	1.097	0.898	0.890
	Mean	−0.429	−0.253	−0.088	0.093	−0.107	−0.117
	Std. dev.	0.496	0.277	0.146	0.171	0.174	0.157
	2.5%	−1.212	−0.861	−0.476	−0.111	−0.587	−0.524
	97.5%	0.394	0.237	0.112	0.570	0.100	0.040

(continued)

Table 14.5 (continued)

Work descriptions	Estimation	Tenants in the age group of 30s					
		Unitary rating	Must-be rating	Unconcerned rating	Fulfilled rating	Contrary rating	Resigned rating
Conversion of the kitchen to a system kitchen	Exp (mean)	0.529	0.783	1.050	1.073	0.792	0.966
	Mean	−0.636	−0.244	0.049	0.071	−0.234	−0.035
	Std. dev.	0.469	0.198	0.149	0.127	0.194	0.154
	2.5%	−1.531	−0.645	−0.225	−0.142	−0.633	−0.434
	97.5%	0.052	0.155	0.402	0.369	0.121	0.237
Conversion of the washstand to a dresser washstand (fitted with three mirrors)	Exp (mean)	0.866	0.942	0.740	1.129	0.777	0.900
	Mean	−0.144	−0.060	−0.301	0.122	−0.252	−0.105
	Std. dev.	0.261	0.140	0.171	0.327	0.317	0.153
	2.5%	−0.624	−0.434	−0.651	−0.542	−1.052	−0.529
	97.5%	0.369	0.184	−0.013	0.802	0.304	0.057
Modification of the toilet to a Western-style toilet (fitted with a washlet)	Exp (mean)	5.966	0.811	0.935	0.970	1.354	1.003
	Mean	1.786	−0.210	−0.067	−0.031	0.303	0.003
	Std. dev.	0.941	0.247	0.103	0.135	0.340	0.072
	2.5%	−0.031	−0.676	−0.377	−0.328	0.060	−0.143
	97.5%	3.011	0.274	0.045	0.253	1.274	0.191
Conversion of the current bath tub to a large one (with reheating function)	Exp (mean)	0.901	0.644	0.901	1.025	0.972	1.021
	Mean	−0.104	−0.440	−0.105	0.025	−0.028	0.020
	Std. dev.	0.147	0.381	0.237	0.112	0.158	0.139
	2.5%	−0.462	−1.245	−0.616	−0.220	−0.404	−0.248
	97.5%	0.103	0.104	0.307	0.291	0.316	0.377

Item	Statistic						
Installation of an intercom with television monitor	Exp (mean)	1.054	1.153	0.970	1.104	1.114	0.992
	mean	0.053	0.143	−0.031	0.099	0.108	−0.008
	Std. dev.	0.134	0.786	0.077	0.195	0.227	0.106
	2.5%	−0.076	−1.254	−0.272	−0.050	−0.036	−0.280
	97.5%	0.454	1.641	0.077	0.648	0.795	0.245
Appearance enhancement by painting the exterior walls	Exp (mean)	0.490	0.728	0.869	0.951	1.022	0.909
	Mean	−0.714	−0.317	−0.140	−0.050	0.022	−0.095
	Std. dev.	0.760	0.318	0.203	0.116	0.220	0.148
	2.5%	−1.839	−1.021	−0.637	−0.346	−0.376	−0.469
	97.5%	0.803	0.071	0.048	0.141	0.681	0.108
Appearance enhancement by painting the roof	Exp (mean)	0.908	0.909	0.960	1.059	1.059	0.896
	Mean	−0.096	−0.095	−0.041	0.057	0.057	−0.109
	Std. dev.	0.352	0.164	0.168	0.150	0.210	0.151
	2.5%	−0.865	−0.439	−0.413	−0.150	−0.333	−0.449
	97.5%	0.508	0.210	0.305	0.485	0.574	0.137
Renewal of the entrance door	Exp (mean)	0.922	0.945	1.007	1.060	0.956	0.959
	Mean	−0.081	−0.056	0.007	0.058	−0.045	−0.042
	Std. dev.	0.190	0.234	0.084	0.109	0.130	0.116
	2.5%	−0.462	−0.556	−0.215	−0.101	−0.438	−0.394
	97.5%	0.299	0.378	0.187	0.382	0.104	0.089
Maintenance of the balcony	Exp (mean)	1.062	0.812	1.065	1.184	1.226	1.020
	mean	0.061	−0.208	0.063	0.169	0.204	0.020
	Std. dev.	0.200	0.252	0.137	0.154	0.231	0.165
	2.5%	−0.332	−0.773	−0.203	−0.134	−0.268	−0.314
	97.5%	0.513	0.258	0.365	0.473	0.674	0.390

Table 14.6 Estimation results of the multinomial probit model (only listing matters that intersect between age and gender based on the Bayesian estimation): tenants in the age group of 40s

Work descriptions	Estimation	Tenants in the age group of 40s					
		Unitary rating	Must-be rating	Unconcerned rating	Fulfilled rating	Contrary rating	Resigned rating
Replacement of flooring	Exp (mean)	0.925	0.630	0.773	0.975	1.048	0.681
	Mean	−0.078	−0.462	−0.258	−0.026	0.047	−0.384
	Std. dev.	0.168	0.272	0.298	0.132	0.235	0.289
	2.5%	−0.473	−0.982	−0.845	−0.301	−0.468	−0.972
	97.5%	0.186	−0.011	0.202	0.304	0.620	0.172
Renewal of wooden fixtures	Exp (mean)	1.051	1.133	0.472	1.111	1.176	0.978
	Mean	0.050	0.125	−0.751	0.106	0.162	−0.022
	Std. dev.	0.094	0.505	0.293	0.111	0.286	0.151
	2.5%	−0.179	−0.493	−1.292	−0.020	−0.091	−0.376
	97.5%	0.232	1.205	−0.180	0.438	1.067	0.257
Sound insulation work with the floor/ceiling	Exp (mean)	1.175	0.567	0.898	1.032	0.998	0.968
	Mean	0.161	−0.567	−0.108	0.031	−0.002	−0.033
	Std. dev.	0.219	0.390	0.169	0.105	0.129	0.121
	2.5%	−0.240	−1.478	−0.551	−0.180	−0.346	−0.377
	97.5%	0.645	−0.045	0.005	0.299	0.295	0.174
Sound insulation work with additional wall layers	Exp (mean)	1.263	0.863	0.582	1.053	1.137	0.906
	Mean	0.234	−0.147	−0.541	0.051	0.128	−0.098
	Std. dev.	0.201	0.142	0.248	0.144	0.164	0.193
	2.5%	−0.161	−0.519	−1.054	−0.137	−0.076	−0.595
	97.5%	0.625	0.016	−0.097	0.470	0.559	0.183

Doubling of sash	Exp (mean)	0.930	0.934	0.508	1.135	0.992	0.956
	Mean	−0.073	−0.068	−0.678	0.127	−0.008	−0.045
	Std. dev.	0.131	0.111	0.286	0.249	0.113	0.100
	2.5%	−0.293	−0.396	−1.250	−0.355	−0.271	−0.314
	97.5%	0.211	0.038	−0.172	0.618	0.264	0.127
Elimination of floor steps	Exp (mean)	1.175	0.567	0.898	1.032	0.998	0.968
	Mean	0.161	−0.567	−0.108	0.031	−0.002	−0.033
	Std. dev.	0.219	0.390	0.169	0.105	0.129	0.121
	2.5%	−0.240	−1.478	−0.551	−0.180	−0.346	−0.377
	97.5%	0.645	−0.045	0.005	0.299	0.295	0.174
Expansion of storage space	Exp (mean)	0.783	1.016	0.940	0.996	0.905	0.948
	Mean	−0.244	0.015	−0.062	−0.004	−0.100	−0.054
	Std. dev.	0.210	0.124	0.120	0.086	0.326	0.153
	2.5%	−0.672	−0.227	−0.395	−0.200	−0.789	−0.430
	97.5%	0.054	0.370	0.083	0.209	0.465	0.236
Modification of Room layout	Exp (mean)	0.640	0.873	0.924	1.273	0.983	0.846
	Mean	−0.446	−0.136	−0.079	0.242	−0.017	−0.168
	Std. dev.	0.381	0.177	0.111	0.257	0.158	0.188
	2.5%	−0.942	−0.596	−0.388	−0.252	−0.403	−0.640
	97.5%	0.518	0.049	0.084	0.741	0.348	0.010
Modification of the Japanese-style rooms to Western style	Exp (mean)	0.447	0.835	0.967	1.158	0.919	0.881
	Mean	−0.806	−0.180	−0.034	0.147	−0.084	−0.127
	Std. dev.	0.723	0.302	0.127	0.207	0.163	0.163
	2.5%	−1.831	−0.836	−0.354	−0.022	−0.514	−0.534
	97.5%	0.282	0.343	0.207	0.690	0.135	0.033

(continued)

Table 14.6 (continued)

Work descriptions	Estimation	Tenants in the age group of 40s					
		Unitary rating	Must-be rating	Unconcerned rating	Fulfilled rating	Contrary rating	Resigned rating
Conversion of the kitchen to a system kitchen	exp(mean)	0.542	1.004	1.096	1.215	0.916	0.981
	Mean	−0.612	0.004	0.092	0.195	−0.088	−0.019
	Std. dev.	0.395	0.175	0.159	0.164	0.144	0.173
	2.5%	−1.534	−0.360	−0.147	−0.014	−0.373	−0.459
	97.5%	−0.034	0.310	0.473	0.559	0.201	0.264
Conversion of the washstand to a dresser washstand (fitted with three mirrors)	Exp (mean)	0.796	1.035	0.853	1.707	1.018	0.913
	Mean	−0.228	0.034	−0.159	0.535	0.018	−0.091
	Std. dev.	0.179	0.125	0.180	0.317	0.243	0.144
	2.5%	−0.601	−0.200	−0.525	0.000	−0.333	−0.488
	97.5%	0.018	0.377	0.170	1.194	0.685	0.078
Modification of the toilet to a Western-style toilet (fitted with a washlet)	Exp (mean)	8.793	1.222	0.967	1.182	1.404	0.993
	Mean	2.174	0.201	−0.034	0.168	0.339	−0.007
	Std. dev.	1.182	0.232	0.126	0.166	0.365	0.071
	2.5%	−0.078	−0.237	−0.423	−0.046	0.061	−0.209
	97.5%	3.633	0.662	0.110	0.564	1.368	0.120
Conversion of the current bath tub to a large one (with reheating function)	Exp (mean)	0.909	0.943	0.828	1.122	1.069	0.996
	Mean	−0.095	−0.059	−0.189	0.115	0.067	−0.004
	Std. dev.	0.144	0.183	0.249	0.149	0.170	0.132
	2.5%	−0.433	−0.461	−0.776	−0.035	−0.225	−0.272
	97.5%	0.105	0.283	0.207	0.527	0.535	0.333

Installation of an intercom with television monitor	Exp (mean)	1.084	1.722	0.977	1.178	1.114	0.963
	Mean	0.080	0.544	−0.023	0.164	0.108	−0.038
	Std. dev.	0.157	0.845	0.077	0.263	0.233	0.113
	2.5%	−0.022	−0.775	−0.257	−0.001	−0.063	−0.349
	97.5%	0.536	2.220	0.110	0.833	0.792	0.176
Appearance enhancement by painting the exterior walls	Exp (mean)	0.804	0.823	0.918	1.040	1.067	0.947
	mean	−0.218	−0.195	−0.086	0.039	0.065	−0.055
	Std. dev.	0.410	0.234	0.171	0.115	0.224	0.133
	2.5%	−0.921	−0.741	−0.523	−0.155	−0.302	−0.392
	97.5%	0.733	0.104	0.164	0.358	0.703	0.197
Appearance enhancement by painting the roof	Exp (mean)	0.761	0.920	1.098	1.212	1.063	0.929
	Mean	−0.274	−0.083	0.094	0.192	0.061	−0.074
	Std. dev.	0.510	0.203	0.170	0.213	0.212	0.142
	2.5%	−1.344	−0.510	−0.227	−0.001	−0.298	−0.382
	97.5%	0.497	0.303	0.470	0.755	0.559	0.199
Renewal of the entrance door	Exp (mean)	0.846	1.113	0.987	1.077	0.931	0.968
	Mean	−0.167	0.107	−0.013	0.074	−0.072	−0.032
	Std. dev.	0.186	0.209	0.091	0.113	0.159	0.108
	2.5%	−0.530	−0.304	−0.302	−0.080	−0.556	−0.361
	97.5%	0.200	0.504	0.114	0.402	0.025	0.133
Maintenance of the balcony	Exp (mean)	1.103	1.411	1.111	1.308	1.288	0.897
	Mean	0.098	0.344	0.105	0.268	0.253	−0.109
	Std. dev.	0.211	0.580	0.145	0.160	0.248	0.169
	2.5%	−0.297	−0.453	−0.137	−0.026	−0.220	−0.478
	97.5%	0.541	1.741	0.430	0.599	0.777	0.208

as obvious" and the "evaluation of resignation," the number of cases where the selection probability of such evaluation relative to the "evaluation as attractive" is a multiple of 1 and above exceeded 20% for all age groups. That is, since females have strong tendency to recognize the implementation of refurbishment work as something too obvious to be done, it is difficult for them to forecast that rent will increase following such work. On the other hand, of the evaluation of the refurbishment work by all residents including males, focusing on evaluations with a multiple of 1.0 and above for the selection probability relative to "evaluation as attractive" more than 10% in each age group provides an "evaluation as already sufficient," which is a high ratio compared to females. That is, there is a relatively large number of residents compared to females who are satisfied with the current dwelling and do not see the need for refurbishment work at the present point in time.

Evaluation Features of Each Type of Refurbishment Work Viewed by Gender and by Age

A large proportion of females in each age group select the "evaluation as obvious" for the evaluation of aesthetics-related work, i.e., "replacement of wooden fittings," and equipment-related work, i.e., "switching to a Western toilet (with washlet)," "switching to a large bathtub (reheating)," and "installation of an interphone with television monitor" (see Table 14.5). Therefore, it is thought that it would be difficult to forecast an increase in rent due to such work, and these are thought to be work that should be considered in at least maintaining the current rent level. In addition, a large proportion of females in their 40s and 50s select the "indifferent evaluation" for the evaluation of external work that "improve the design due to exterior painting" or "improve the design due to roof painting," so it is difficult to anticipate an increase in rent due to such work.

On the other hand, a higher proportion of females in each group selected "evaluation as attractive" over "evaluation as obvious" for their evaluation in relation to "work that change the floor plan of the residence" and "work that change Japanese-style rooms."

Therefore, it can be expected that such work could contribute somewhat to lifting rent.

As in the above, the implementation of refurbishment work does not necessarily increase the level of satisfaction of residents, and it is important to be aware that not doing such work could lead to dissatisfaction and calls for the current rent to be lowered.

14.6   Awareness Analysis Concerning the Rental Premium Following Refurbishment Work

14.6.1   Investigating of the Model

Since willingness to pay, WTP, is observed with 0 yen as threshold value, we will use the tobit model. The target objective variable is considered to be the rental premium[2], which is the proportion relative to the willingness to pay: WTP rent level taking account of the ease of comparison. In addition, such model is estimated to be the Bayes model[3]. The merit is that it can generate as a latent variable those variables that otherwise are taken together to be 0 yen without being observed since they take negative values.

Note that, for the 18 types of refurbishment work, 5 levels of dummy variables are aggregated by category (see Table 14.3).

The payment function for the rental premium on the dwelling following refurbishment work is formularized as follows. The independent variables are the resident's attributes, property attributes, and the dummy variable for the refurbishment work based on the results of the polynomial logistic regression analysis mentioned in 4 above, and we also included the number of locations requiring refurbishment. In addition, the cognitive evaluation of the current dwelling is thought to have an impact on the willingness-to-pay amount, so the level of satisfaction with the dwelling and sense of expensiveness toward the rent are respectively used as variables related to the cognitive evaluation of the residents dwelling. The general expression is as follows.

We assume that $\tau = 1/\sigma 2$ and that prior distributions of β and τ have normal distribution and gamma distribution, respectively, as follows, with reference to Terui (2010) and Furutani (2008).

The conditional posterior distribution is as follows when Yi is given.

Note here that definitions are made as follows.

Y* shows a truncated normal distribution as set out below, and we apply Gibbs sampling to it.

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[2]Responses were obtained from the following question in relation to the rent premium. "If work is to be made that 'you like,' what maximum level of increase in monthly rent would you be willing to accept due to increased level of satisfaction compared to the current dwelling? Please respond by noting the maximum amount of increase in the rent you would be able to pay the owner. Note, when responding, please fully consider the rent level you are currently paying."

[3]Statistical analysis software used R. Specifically, The MCMCtobit function of the MCM pack was used. The number of repeated calculations was taken to be 10,000 and the operation inspection period (burn-in) 1000. In addition, prior distribution was taken to be non-informative prior distribution.

14.6.2 Model Estimation Results

The MCMC (Markov chain Monte Carlo) method is a method for simulating the Markov chain with ergodic theory (Table 14.7).

Therefore, it is necessary to confirm a steady state that is not dependent on the initial value. In this research, a convergence test based on Gelman-Rubin statistics was done, and such statistics were 1.00 for all variables confirming them to be 1.05 or below. Therefore, it can be judged to be converging.

Looking at the 95% confidence interval of parameters, each parameter also has a stable sign condition at such level. In this regard, a significant result different from zero can be said to be obtained.

14.6.3 Measurement of the Rental Premium Through Simulation Using the Model

The rental premium by gender and age of residents is estimated[4] using the model estimated above. In addition, in terms of the time for undertaking the refurbishment work, this was done by combining with a comparison of the rental premiums at points 20 years and 40 years since construction.

Note that three types of relevant refurbishment work were set with the intent of grasping the change in the rental premium due to an increase in the number of places where work is done.

1. Comparison of the rental premium following indoor aesthetic work, equipment work and external work

    There is no recognition of a rental premium for any group of residents by gender or age group in relation to dwellings that were refurbished at the point 20 years or 40 years since construction (see Table 14.8).

    Considering the results of the multinomial logit model in Table 14.6 (see Tables 14.5 and 14.6), such result is estimated to be due to the tendency of females in their 30s and older in particular to consider "evaluation as obvious" while refurbishment work evaluated with an "evaluation as attractive" or "unified evaluation" is not observed evaluation as obvious. It appears that the number of places where refurbishment work is done needs to be increased for residents to recognize a rental premium.

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[4]In regard to the estimates of rental premiums, residents' anticipated annual income is taken to be the average wave by age group based on the National Tax Agency, "Statistical Survey of Actual Status for Salary in the Private Sector 2015," September 2016. In addition, in regard to exclusive floor area, it was taken to be 45 m2 with reference to the total floor area per single rented house in the Statistics Bureau, Ministry of Internal Affairs and Communications, "2013 Housing and Land Survey." Furthermore, in regard to the degree of expense concerning residents' level of satisfaction in the dwelling and the current rent, the normal level is anticipated.

Table 14.7 Tobit model estimation results using Gibbs sampling

Variable			Mean	Standard deviation	2.5%	50.0%	97.5%
Tenants characteristics (based on males and the age of 20s)	α_1	Annual household Income (in a million JPY)	0.000	0.000	0.000	0.000	0.000
	α_2	Females dummy (Yes = 1)	−0.045	0.011	−0.067	−0.045	−0.023
	α_3	30s (Yes = 1)	−0.041	0.010	−0.061	−0.041	−0.021
	α_4	40s (Yes = 1)	−0.042	0.010	−0.061	−0.042	−0.023
	α_5	50s (Yes = 1)	−0.047	0.011	−0.067	−0.047	−0.026
	α_6	Females × 30s (Yes = 1)	0.029	0.013	0.004	0.029	0.054
	α_7	Females × 40s (Yes = 1)	0.029	0.013	0.004	0.029	0.054
	α_8	Females × 50s (Yes = 1)	0.046	0.014	0.017	0.046	0.073
Tenants' feeling	β_1	Satisfaction to the rental apartment (rating: Rank 1–5)	−0.006	0.002	−0.010	−0.006	−0.003
	β_2	Overvalued rent (rating: Rank 1–5)	−0.018	0.002	−0.021	−0.018	−0.015
Housing characteristics (based on Tokyo's 23 wards)	γ_1	Individual unit area(unit: m^2)	0.000	0.000	−0.001	0.000	0.000
	γ_2	Renovation(Yes = 1)	0.019	0.008	0.003	0.019	0.034
	γ_3	Architectural age	−0.001	0.000	−0.001	−0.001	0.000
	γ_4	Chiba City dummy(Yes = 1)	0.017	0.006	0.005	0.017	0.029
Reform works classification (based on out-door works)	θ_1	Number of reform works expected	0.021	0.001	0.020	0.021	0.022
	θ_2	Indoor works: appearance dummy (Yes = 1)	0.019	0.004	0.011	0.019	0.028
	θ_3	Indoor works: sound insulation dummy (Yes = 1)	0.018	0.005	0.008	0.018	0.028
	θ_4	Indoor works: space dummy (Yes = 1)	0.013	0.005	0.003	0.013	0.024
	θ_5	Facility work dummy (Yes = 1)	0.031	0.005	0.021	0.031	0.041
	σ^2	sigma2	0.802%	0.032%	0.742%	0.801%	0.867%

Table 14.8 Estimation results for rental premium following refurbishment work views by residents' gender and age

Subject reform works	Tenants' age	Building age: 20s		Building age: 40s	
		Females	Males	Females	Males
1. Indoor works: appearance	20s	0.0%	0.0%	0.0%	0.0%
2. Facility work	30s	0.0%	0.0%	0.0%	0.0%
3. Outdoor works	40s	0.0%	0.0%	0.0%	0.0%
Total three works	50s	0.0%	0.0%	0.0%	0.0%
1. Indoor works: appearance	20s	0.0%	3.9%	0.0%	2.7%
2. Indoor works: sound insulation	30s	0.0%	0.2%	0.0%	0.0%
3. Facility work	40s	0.0%	0.5%	0.0%	0.0%
4. Outdoor works	50s	0.0%	0.2%	0.0%	0.0%
Total four works					
1. Indoor works: appearance	20s	2.6%	7.3%	1.4%	6.1%
2. Indoor works: sound insulation	30s	1.4%	3.6%	0.3%	2.4%
3. Indoor works: space	40s	1.3%	3.9%	0.1%	2.7%
4. Facility work	50s	2.5%	3.6%	1.4%	2.5%
5. Outdoor Works*Total five works*					

2. Comparison of rental premiums following indoor aesthetic work, indoor sound insulation work, equipment work, and external work

By adding indoor sound insulation to (1) above, males in their 20s recognized a rental premium, albeit limited (see Table 14.8).

A rental premium for dwellings that were refurbished 20 years after construction was recognized at the highest level for males in their 20s, estimated at 3.9%. The level was below 1.0% for age groups of 30s and above, which is a result that lacks economic value in terms of the rent increase rate. On the other hand, females in all age groups die not recognize a rental premium.

A rental premium for dwellings that were refurbished 40 years after construction was also recognized by males in their 20s, at 2.7%. This was 1.2% points below the level for 20 years after construction, suggesting the tendency for a rental premium decline with the number of years since construction (see Table 14.8). In addition, males in their 30s, like females, do not approve of a rental premium.

As in the above, the comparison of (1) above and (3) below indicates an increase in the number of places where refurbishment is requested has a positive impact on the rental premium (see Table 14.7). On this point, Cho and Takada (2015) note that large scale refurbishment is an important trigger when deciding to purchase and observed that the greater the increase in the number of places of refurbishment work the greater the increase in the residents' utility. It is said that this is consistent with previous research.

3. Comparison of the rental premium following indoor aesthetic work, indoor sound insulation work, indoor spatial work, equipment work, and external work

By adding indoor spatial work to (2) above, a rise in the rental premium is forecast. Males in their 20s indicated the highest rental premium for dwellings that undergo refurbishment 20 years after construction, estimated at 7.3%. (See

Table 14.8). The value indicated by males in their 30s to 50s is only about 50% of those in their 20s. On the other hand, females estimate low values overall in comparison to the rental premiums of males in the same age group. Specifically, females in their 20s and 50s have a relatively high rental premium of 2.6% and 2.5% respectively. In addition, females in their 30s and 40% are estimated to both have levels below 2%.

For dwellings that were refurbished 40 years since constructions, as was similar thus far, a decline of about 1.2% points in the rental premium for all groups by gender and by age (see Table 14.8).

For males in their 20s, who recognized the highest rental premium, this is estimated to be 6.1%. In this regard, females in their 20s stopped at 1.4%. However, the lowest rental premium was recognized by females in their 30s and 40s with a rental premium below 1.0%, which is a result that lacks economic viability. For males in their 30s to 50s, the rental premium is estimated at 2.0% to 3.0%.

Therefore, this confirms that the number of years since construction has a negative impact on the rental premium for a dwelling.

Lastly, we add a study of the appropriateness of the estimation value of the rental premium.

For example, Harano et al. (2012) compare the transaction price for condominiums following large-scale refurbishment with the transaction price for those that have not been refurbished, pointing that they were 12.84% higher. Although the research target was not the rent, this is thought to have generated an appropriate result in estimation within the scope of such result.

14.7   Conclusion

An increase in rent following refurbishment is no doubt one requirement to indicate the economic rationality of undertaking refurbishment. Therefore, the measurement of rental premium that conforms to the refurbishment work is thought to be useful in the decision-making for undertaking such work.

Apart from residents' gender and age having an impact on rental premium, the results also indicate that the exclusive floor area of the dwelling and the number of years since construction have an impact. In addition, it is important to note that rental residents' level of satisfaction with the dwelling and sense of whether the current rent is expensive have a negative impact on the rental premium.

In increasing the ratio of investment impact from refurbishment, a well-planned execution would be desired that takes into consideration the floor area of the relevant dwelling and the number of years since construction as well as the gender and age of the occupants that all impact the rental premium.

Future issues for consideration would be to expand the target of refurbishment work to include earthquake resistance and energy-saving performance of the building and to measure their rental premiums.

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Chapter 15
Feasibility Evaluation for Condominium Reconstruction by Means of the Application of Discriminant Analysis on Real Estate Data

Toshihiro Hanazato

Abstract This paper discusses the application of discriminant analysis on real estate data as a feasible estimation method for condominium reconstruction. The proposed method was used in order to verify its prediction capacity managing data from the real estate and resulting in 89.4% accuracy. This method revealed and highlighted the structure of four explanatory variables in terms of prediction impact. Further, it has been clarified that only three out of these four explanatory variables mentioned above were selected and constantly used in order to explain each analytical model.

Keywords Condominium · Reconstruction · Renovation · Discriminant analysis · Real estate data · Act for Smoothening Condominium Reconstruction · Act on Facilitation of Reconstruction of Condominiums

15.1 Introduction

15.1.1 Background to the Problem

In this study, "condominium" refers to an apartment-type residential building that is a reinforced concrete (RC) structure or steel-framed reinforced concrete (SRC) structure, with the rights of owners protected under the Act on Building Unit Ownership, etc.[1]

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[1]The definition of the condominium according to the Ministry of Land, Infrastructure, Transport and Tourism is "A building where 2 or more unit owners exist with exclusive elements that are shared by residents, the site thereof and attached facilities" (extract from the part concerning single buildings on the Ministry of Land, Infrastructure, Transport and Tourism website). The structure of
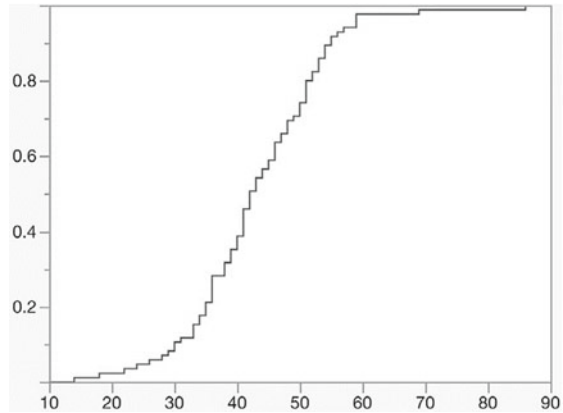

T. Hanazato (✉)
Faculty of Art and Design, University of Tsukuba, Tsukuba, Ibaraki, Japan
e-mail: hanazato@geijutsu.tsukuba.ac.jp

Fig. 15.1 Cumulative probability graph concerning the ages of reconstruction (n=85)

The period from the completion of construction of a condominium until its reconstruction is presented in the cumulative probability graph shown in Fig. 15.1. This by itself indicates the period for introducing condominiums coincided with World War II, so properties built 60–90 years ago are plateauing. However, apart from this, there is no other particular information to be obtained from the graph, which is just an ordinary cumulative probability graph.

These had an average life of 43.15 years with a median life of 42 years.[2]

According to research on concrete carbonation (Sawaki et al. 2008; Tanuma and Sugiyama 2016), the physical life span of building concrete in RC structures such as condominiums is at least about 60 years, albeit there is a range. Rather than the deterioration of the building framework itself, condominiums often face the end of their life span due to social obsolescence.

In fact, given that condominiums are a fixture in modern society, rapid social changes and progress in science and technology may cause such position to change, and it is understandable that various forms of obsolescence are taking place. That is, there is a mismatch between technological progress and the continuing deterioration of buildings. In particular, there has been obsolescence in condominiums due to aspects such as earthquake resistance performance and barrier-free performance compared to when they were constructed. First, in terms of earthquake resistance performance, buildings constructed in or prior to 1982 were based on former earthquake resistance standards and are considered more susceptible to earthquakes when compared to the currently prescribed standards. In addition, obsolescence due to barrier-free performance is because there are many buildings without elevators in complexes with staircases. On top of this, the progress in the low birth rate and aging

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the building is not designated here, but there is no mistaking that the definition is referring to durable RC structures, so we have defined as above.

[2]According to materials from the Ministry of Land, Infrastructure, Transport and Tourism, there was a total of 230 condominium buildings being reconstructed or prepared for reconstruction as at April 1, 2016.

Table 15.1 Outline of the targets of the analysis

Analysis model 1	Reconstruction		Repair restoration	
132	85		42	
4 classifications	Uninterrupted method	Equivalent exchange	Large-scale restoration	Seismic resistant repair
132	61	24	23	24

population means phenomena such as the increase in vacant houses are also having a large impact.

There are various problems apart from the obsolescence caused by changes on an earthquake resistance basis and barrier-free performance. This includes many problems where, although the solution is currently known, a property cannot be retrofitted and needs to be reset. Reconstruction is considered an effective solution to such problems.

Reconstruction treats condominiums as things, but in reality, this is a human problem with various types of people participating in the process to form agreement itself. When there is a plan to reconstruct despite the lack of severe deterioration and obsolescence, there is also a large resistance from people with different opinions. In fact, when people involved in condominium reconstruction are asked, they say that the process of reaching agreement takes a lot of time and energy (Meno 2004). If reconstruction is to take place because of the life span, it becomes difficult to judge, and the available options face high hurdles, so people's judgments become divided. However, the main cause of obstructions to reconstruction is not clear even among researchers and reconstruction specialists, posing the issue as an open question by Tamura (2012). As noted above, there could be human factors, and there could be also important factors such as the problem of surplus floor area ratio and the building location, yet nothing is definitive. On the other hand, Ooki (2016) points to the large change in the prices of secondhand properties when there is reconstruction, and the advisability of reconstruction is discussed as having direct impact on the evaluation of the existing property prices. Therefore, comprehensively taking into consideration the aforementioned, he came up with a hypothesis that it was possible to evaluate the objective real estate data such as floor area and transaction price of existing properties as well as the pros and cons of reconstruction.

Therefore, this research does not delve into the reconstruction process, but hypothesizes that condominium reconstruction can be explained by using real estate data as an objective indicator. As already indicated, various factors are involved, so since it is unlikely to be able to explain by using a single factor, a discriminant analysis, one of the multivariate analyses, was conducted.

15.1.2   Review of Research

The review of the research conducted on condominium reconstruction has shown a variety of past works. On the one hand, there is one that explained a project as a case study. For example, Higuchi (2016) discussed the process up until the reconstruction of condominiums on which he was involved as a consultant. The key points of project execution were explained from the perspective of individual circumstances, which is easy to understand. By contrast, an editorial by Fukui (2012) took a broader approach, looking at what policies were needed to be taken to deal with the social problems of condominium reconstruction, and also, it included thought-provoking suggestions. The former is researched from the perspective of people involved in reconstruction, particularly residents, whereas the latter is researched from a broader perspective. This paper takes the latter bird's-eye view approach to reconstruction. In addition, in terms of comparative legal research on reconstruction, Kamano et al. (2014) researched the legal systems for condominiums in European countries and the United States. While there are clear differences between countries, virtually no country has enshrined reconstruction in their legislation. At present, only some countries such as South Korea and Japan have taken independent initiatives concerning condominium reconstruction.

Various methods have been used in regard to the approach concerning the impact of the introduction of the Act on Facilitation of Reconstruction of Condominiums. Yunokihara et al. (2017) clarified the reconstruction methods and interviewed operators in an investigation of examples before and after the application of the Act on Building Unit Ownership, etc. The revision and the application of the Act on Facilitation of Reconstruction of Condominiums discussed how such legal revisions made reconstruction easier. Asami and Ishikawa (2012) discussed what sort of impacts the mitigation of the majority requirement, under the Facilitation Act, etc., had from a policy perspective. Furthermore, Osawa (2014) discussed this problem using data from a bird's-eye view of reconstruction as a whole.

In recent years, there have also been special editions discussing the difficulties of condominium reconstruction. Saito (2016), in a 2016 Special Edition of the Journal of the Japan Institute for Condominium Living entitled "Current status and issues for suburban condominiums," referred to an impending period of large conversion for suburban complex condominiums. On the other hand, Hasegawa (2002) asserts that complex condominiums are difficult to reconstruct because of factors such as the complicated relationship of rights in the certification as a single complex and their large scale.

Conversely, it could seem that a single wing condominium would be comparatively easy to reconstruct, but instead, there are few examples of evaluation research to date that have looked at the reconstruction of single wing condominiums and evaluated which have been easy to reconstruct. However, considering the large amount of stock of such single wing condominiums, the conditions that determine which are reconstructed will need to be clarified for there to be steady flow of reconstructions.

In addition, in recent years, there have been announcements advocating the need for long-term management for a considerable period prior to reconstruction and special edition articles encouraging the importance of education to disseminate activities to owners of specialized knowledge (Hasegawa 2003, 2016).

In regard to condominium reconstruction, a "restoration ratio"[3] determined mainly by factors such as the surplus floor area ratio and construction costs and the market price of new construction in the vicinity of the condominium is often used as an indicator of the ease of project execution. However, this restoration ratio is also related to the construction costs and the proportion of dwellings left with the reconstruction; thus, it is not easy to understand before starting the project. In addition, there has not been enough discussion about what type of value has to be taken as the threshold value that enables judgment on the possibility of reconstruction.

There is also research attempting to handle the entire reconstruction from aspects such as cost. Meno (1998) selected three wards within the Tokyo Metropolitan Area, taking account of the matters such as the previous building attributes and the legal regulations in the area, to estimate the possibility of reconstruction costs. Onuma et al. (2009) and Kobayashi (2017) created a project of cost model for reconstruction simulation. A standardized restoration ratio, i.e., the burden amount for each unit owner, was calculated from conditions, such as the price of land and the floor area ratio, and graphed together with the price of land in the vicinity and the floor area ratio. It indicated the possibility of predicting the level at which people would select reconstruction based on a reasonable judgment.

In any event, an example of research using discriminant analysis to delve into the possibility of condominium reconstruction, as presented in this paper, has not been seen elsewhere (Hanazato 2017).

15.1.3 Research Purpose

The series of research, including this paper, is aimed at a round estimated number of condominiums with reconstruction possibility for a particular area through the application of discriminant analysis based on the real estate data for existing reconstructed properties.

The first step is to determine if reconstruction can be identified from condominium real estate data. The underlying propositions are as follow. The purpose is to confirm the outcome of "It is possible to identify condominium reconstruction from the past" (Proposition 1). The second step is to indicate the meaning of independent variables selected using the variable selection method for the condominium

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[3]Floor area provided to the previous beneficiary with no cost is a percentage in relation to the floor area of previous rights, and 100% means the rights for the same area as in the past can be obtained at no cost.

reconstruction project, with the purpose of clarifying that "The possibility of reconstruction can be estimated by combining real estate data that become the independent variables" (Proposition 2).

15.2 Research Method and Target

15.2.1 Discriminant Analysis Procedures

Discriminant analysis is an evaluation of feasibility for qualitative results taken from quantitative data. For example, it is used in the identification of the name of a disease from the numerical values of pathological examination (Ito et al. 1976; Ai 2016). At present, it is a method widely used in multivariate analysis such as in information processing.

Here, the attributes of "reconstruction" and "repair and renovate" for each example are used as the objective variable. On the other hand, independent variables, which are associated with the objective variable, are chosen for significant combination with covariates by a variable selection method through the analysis to address this.

That is, the procedures in this paper are first in Sect. 15.2 to separate examples into the "reconstruction group" and the "repair and renovate group" in order to compile real estate data for condominiums. In Sect. 15.3, discriminant analysis is conducted, and a prediction is made with the actual measured value of the analysis targets, to obtain the discriminant coefficient, i.e., the discriminant equation.

Next, in Sect. 15.4, condominiums which have not yet reconstructed are selected, and it is confirmed that it can be discriminated whether they shall be "reconstructed" or "repaired and renovated" by actually substituting real estate data into the discriminant equation. In Sect. 15.5, the results of analysis are interpreted.

15.2.2 Targets of Analysis

The objective variables used are the attributes of "reconstruction" or "repair and renovate" as shown below. Examples of targets of such analysis are categorized into two groups or four groups in Table 15.1.[4]

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[4]When the analysis was planned, the following points were taken to be stated conditions. First, the 230 examples of successful reconstruction are certain, but at the present point in time, the real estate data for only about 100 of these examples are available. In addition, they were primarily the cases that used the Facilitation Act, which account for more than half. To extract a corresponding control group or comparison group was difficult for the following additional three reasons. First, initially, it was completely unknown whether the reconstruction group could be identified through discriminant analysis, so there needed to be a group expected to produce a certain outcome for comparison

Explaining the 4 groups, there are 61 examples of "Facilitation Act" group, which are all examples of condominiums that were actually reconstructed using the Act on Facilitation of Reconstruction of Condominiums that was enacted in 2002.

A comprehensive selection was made of the items that could be obtained from materials listed on the Mansion Saisei Association (Condominium Rehabilitation Association) website.

In addition, the "equivalent exchange" group refers to condominiums reconstructed with the equivalent exchange method in accordance with the provisions of the Act on Building Unit Ownership, etc. These were also mainly selected based on the materials of the Mansion Saisei Association. These two groups combined were chosen as the "reconstruction" group.

Furthermore, the 23 examples of the "earthquake resistance renovation" group and 24 examples of the "large-scale repair" group were created using data concerning the management status of old condominiums previously researched and published by the author and others (Hanazato 2014). These were examples of condominiums proactively selected from "earthquake resistance renovation" and "large-scale repair" forming a different group in terms of being selected separately from the "reconstruction group." Conversely, since reconstruction was judged to be difficult for reasons such as the existing disqualification of the floor area ratio, they can also be considered examples of "earthquake resistance renovation" and "large-scale repair." In this paper, these two groups are combined as the "repair and renovate" group.

Observing the basic statistics for the condominiums area as the target of this analysis (Table 15.2), a number of average values are much the same for "reconstruction" and for "repair and renovate," yet others are quite different. For example, the change in the floor area ratio for "reconstruction" is nearly five times of "repair and renovate," while the previous gross floor area for "repair and renovate" is about twice of "reconstruction." In addition, the previous land appraisal value of each dwelling for "reconstruction" is about triple the level for "repair and renovate."

So, the examples of "reconstruction" and "repair and renovate" appear to have a certain bias that reflects their respective backgrounds.

15.2.3 Twelve Covariates

Twelve covariates were prepared as candidates for independent variables for the analysis.

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purposes. Third, it was likely that the ease of reconstruction would differ by area, so it was not known how selecting a particular area would represent the total. Fourth, it was forecast that data would be very difficult to obtain. Since a certain degree of data was available for the earthquake resistance renovation group and the large-scale repair group, they were combined into the repair and renovate group and selected as the comparison group relative to the reconstruction group.

Table 15.2 Covariate basic statistics

Covariance	Category of covariance	Total		Reconstruction	Repair restoration	Uninterrupted method	Equivalent exchange	Large-scale restoration	Seismic resistant repair
n		132		85	47	61	24	23	24
		Average	Standard deviation	Average	Average	Average	Average	Average	Average
Previous site area (m²)	Scale	4781.21	7672.73	5083.00	4232.44	5422.52	4220.03	4076.77	4387.5
Previous total floor area (m²)	Scale	7614.20	7416.71	5230.88	11924.46	5469.54	4624.03	12,253.30	11,609.33
Previous use volume ratio (%)	Land use	247.12	182.31	199.09	333.97	206.85	179.35	335.92	332.10
Legal volume ratio (%)	Land use	304.92	127.64	307.06	301.06	304.92	312.50	297.83	307.14
Volume ratio after reconstruction (%)	Land use	386.92	223.42	396.72	374.64	388.88	406.02	370.88	378.24
Increase and decrease of volume ratio (%)	Land use	138.81	170.16	194.63	40.66	182.02	226.66	34.95	46.13
Previous number of dwelling units (units)	Scale	108.26	106.48	80.16	159.06	82.72	73.67	157.43	160.63
Total floor area/number of dwelling units (m²/unit)	House-to-house scale	76.07	30.87	76.59	75.12	75.96	78.19	77.38	72.98
Site area/number of dwelling unit (m²/unit)	House-to-house scale	29.62	29.62	54.03	29.01	52.52	57.87	27.74	30.23
Nearby land prices (10,000 yen)	Conditions of nearby real state agencies	69.40	80.61	79.32	51.45	80.14	77.25	43.57	59.01

Evaluation sum for previous housing land division (10,000 yen/unit)	Conditions of individual real state agencies	2606.16	3266.06	3441.77	1094.96	3581.71	3908.46	980.39	1204.76
Building years at time of reconstruction (years)	Number of passing ages	41.89	9.40	43.15	39.61	42.75	44.17	40.30	38.96

The categories of the aforementioned covariates are shown in Table 15.2. Thinking about subsequent stepwise selection, multiple covariates were prepared for each category.

Here, it is possible to identify respective covariates as being some form of proxy variable, that is, "legal floor area ratio," which can be considered a proxy variable corresponding to land use in the vicinity.

And "the previous land appraisal value for each dwelling" is thought to correspond to the condition of the real estate market; "the number of years since construction at time of reconstruction" is also a proxy for the proportion of elderly or the average age. Thus, it is possible to consider this as a proxy variable concerning residents' attributes.

Of the aforementioned 12 covariates, priority was given to the use of data obtained from the Mansion Saisei Association website. The calculation methods for items defined and guided by the author are, respectively, as follows:

"The previously used floor area ratio" is calculated by "the previous total floor area/the previous plot area." "The floor area ratio following reconstruction" uses the actual floor area ratio following reconstruction for reconstructed properties. Regarding to the not yet reconstructed properties, the legal floor area ratio is multiplied by a certain coefficient. In addition, "the change in floor area ratio" is taken to be "the floor area ratio following reconstruction minus the previously used floor area ratio." "The previous land appraisal value for each dwelling" is taken to be "the market value of land in the vicinity x previous plot area/number of dwellings."

15.2.4   Discriminant Analysis Calculations

The discriminant analysis calculations were done using ESUMI Co., Ltd.'s MAC Multivariate Analysis Ver. 3. The variable selection method used the stepwise backward selection method, with selection using the two in two out principle.

15.3   Results

15.3.1   Results of Analysis

In relation to the targets of analysis shown in Table 15.1, the four covariates from Table 15.3 were extracted as significant independent variables using the stepwise backward selection method: "the previous plot area," "the previous total floor area," "the change in the floor area ratio," and "the previous land appraisal value for each dwelling."

In addition, the null hypothesis was dismissed in regard to the results of the homoscedasticity and Box M inspection in Table 15.4 with different population

Table 15.3 Discriminant equation

	Discriminant coefficient	Standardized discriminant coefficient	F value	P value	Judgment
Increase and decrease of volume ratio (%)	0.000694	−0.719	17.72	0.000	**
Previous total floor area (m²)	−0.000315	−1.04	38.79	0.000	**
Previous site area (m²)	0.000181	−1.87	11.29	0.001	**
Evaluation sum for previous housing land division	0.000176	−0.264	4.023	0.047	*
Constant clause	0.1156				

n.s.: p value $\geqq 0.05$, *: p value <0.05, **: p value <0.01

Table 15.4 Homoscedasticity and Box M inspection

Chi-squared	307.14
Degree of freedom (df)	15
P value	0.000
Judgment	**

n.s.: p value $\geqq 0.05$, *: p value <0.05, **: p value <0.01

Table 15.5 Discriminant equation inspection

Wilks' lambda	0.506
Frequency	9.68
Degree of freedom 1 (df1)	12
Degree of freedom 2 (df2)	119
P value	0.000
Judgment	**

n.s.: p value $\geqq 0.05$, *: p value <0.05, **: p value <0.01

variances for both groups.[5] Furthermore, as shown in Table 15.5, the null hypothesis was also dismissed for the inspection results of the discriminant equation, and this also appears to be statistically certain.

The discriminant score table is omitted. Fig. 15.2 splits the "reconstruction" group on the left and the "repair" group on the right, plotting the value of the estimated figures for a total of 132 condominiums in accordance with the discriminant scores.

"Reconstruction" and "repair and renovate" are identified as either 0 or more or below 0. As shown in the n table in Tables 15.6, 15.7, and 15.8, 8/85 of the reconstruction group is below 0 and misjudged as "repair and renovate." On the other hand, 6/47 of the "repair and renovate" group are misjudged to be "reconstruction." These results are summarized in Tables 15.9, 15.10, and 15.11, with the

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[5] As discussed in Sect. 15.2.2, this is thought to reflect the inability to guarantee the randomness of the control group, but this is anticipated considering the original purpose and assumed conditions of this paper. In addition, how to set the control group is the next issue.

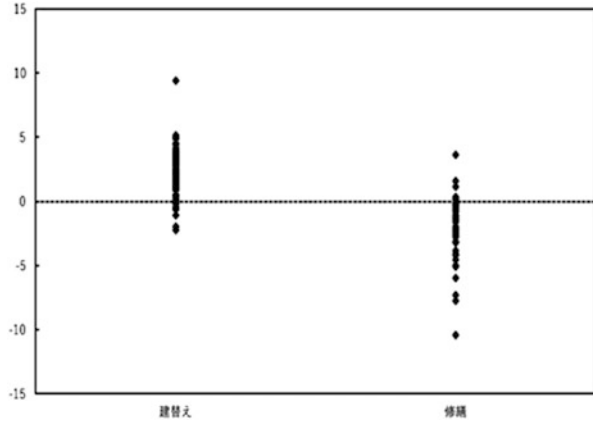**Fig. 15.2** Results of discriminant analysis concerning reconstruction possibility

Table 15.6 Discriminant cross table

	Reconstruction	Repair restoration	Total
0 or more	77	6	83
Less than 0	8	41	49
Total	85	47	132

Table 15.7 Horizontal % table

	Reconstruction (%)	Repair restoration (%)	Total (%)
0 or more	92.8	7.2	100
Less than 0	16.3	83.7	100
Total	64.4	35.6	100

Table 15.8 Vertical % table

	Reconstruction (%)	Repair restoration (%)	Total (%)
0 or more	90.6	7.1	62.9
Less than 0	17.0	87.2	37.1
Total	100	100	100

Table 15.9 Analytical precision

Discriminant predictive rate	89.40%
Certainty of misclassification	15.30%
Mahalanobis squared distance	4.1945
Correlation ratio	0.494

Table 15.10 Degree of realization

Reconstruction	92.8%
Repair restoration	83.7%

Table 15.11 Degree of predictability	Reconstruction	90.6%
	Repair restoration	87.2%

degree of realization of "reconstruction" at 92.8%, the degree of realization of "repair and renovate" at 83.7%, and a discriminant predictive ratio of 89.4%.

The discriminant predictive ratio which appears in the last above is the most general indicator of this analysis and shows a very high value at close to 90%. This indicates that there is a relationship between real estate data and reconstruction possibility as well as providing proof established by Proposition 1.

15.3.2 Discriminant Equation

The discriminant equation to calculate each discriminant score was obtained as follows:

$$y = 0.000694x1 - 0.000315x2 + 0.000181x3 + 0.000176x4 + 0.1156 \quad (15.1)$$

(Here, x[x1: the change in floor area ratio, x2: the previous total floor area, x3: the previous plot area, x4: the previous land appraisal value for each dwelling] is the variable indicated in the basic statistics shown in Table 15.2. b is a constant term.)

15.3.3 Misjudgment

Taking into examination the misjudgements in the n table shown in Table 15.6 and considering a concrete example in which "repair" was predicted, the actual measured value was "reconstruction," eight examples being Apartment E, Housing H, Condominium F, Complex I, Chateau M, Heights S, Condominium K, and Cooperative Housing T.

In addition, the explanation of reverse misjudgments is omitted from a privacy perspective.

When the author and others separately interviewed consultants specialized in reconstruction, we realized that the process of reconstructed condominiums that were misjudged for "repair and renovate" included considerably difficult projects. Moreover, four examples that highlighted the restoration ratio are Apartment E 53%, Housing H 83%, Condominium F 19%, and Complex I 83%. Not only all of these fell short of the 100% restoration ratio that is sometimes considered the basis of reconstruction, but these also included the example of a 19% ratio for Condominium F. Therefore, this evidences that the projects were undertaken under considerably marginal conditions.

Table 15.12 Details of Condominiums A, B, and C

Apartment	A	B	C
Location	Takanawa, Minato-ward, Tokyo City	Nagatakita, Minato-ward, Yokohama City	Taga, Minami-ward, Fukuoka City
Site area (m^2) x3	2943.30	10,867.69	4078.26
Floor area (m^2) x2	8697.26	8226.00	7016.30
Previous use volume ratio (%)	295.50	76.00	172.00
Legal volume ratio (%)	350.00	150.00	150.00
Available volume ratio (%)	435.86	173.99	173.99
Increase and decrease of volume ratio (%) x1	140.36	98.30	1.95
Number of dwelling units (unit)	73	140	81
Units' total floor area (m^2)	119.14	58.76	86.62
Units' site area (m^2)	40.32	77.63	76.00
Land-to-land asset evaluation (10,000 yen) x4	4274	1335	1284
Nearby land prices (10,000 yen/m^2)	106	17	25
Number of built ages (years)	45	43	43

15.4 Discrimination of Condominiums

15.4.1 Outlines of Condominiums A, B, and C

Here, we consider the linear discriminant model and actually substitute the data for three not yet reconstructed condominiums into the discriminant equation based on the predicted results of the analysis of the actual "reconstruction" examples and "repair and renovate" examples. The 12 covariates, including the 4 independent variables for Condominiums A, B, and C, are presented in Table 15.12. In addition, an outline is provided below for each condominium, including information other than the selected variables.

Condominium A is a small- to medium-sized high-end condominium comprising 73 dwellings that was constructed 45 years ago in Takanawa, Minato-ku, Tokyo. The total floor area per residence is just under 120 m^2 in what is also a large-scale dwelling. The land asset appraisal value per residence is high at 42.74 million yen. Almost all of the 300% of legal floor area ratio is already used, but it is calculated that usage of a further 140% floor area ratio is possible due to regulatory revisions, etc.

Condominium B is a medium-sized condominium comprising 140 dwellings built 43 years ago located in Nagatakita, Minami-ku, Yokohama City. The total floor area per residence is calculated to be more than 58 m^2, and the land asset appraisal value per residence is calculated to be more than 13 million yen. In addition, the possible use floor area ratio is calculated to be about 100% in addition to the current floor area ratio.

Condominium C is 81 condominiums built 43 years ago in Taga, Minami-ku, Fukuoka. The total floor area per residence is calculated at more than 85 m^2, and the land asset appraisal value per residence is calculated at just under 13 million yen. However, the possible floor area ratio available is calculated to be less than 2% more than the current floor area ratio.

15.4.2 Prediction of Reconstruction

Substituting these data into the discriminant equation outlined in Sect. 15.3 produces the results presented in Table 15.13.

Condominium A's discriminant score was 0.6135 with a positive value and the discriminant result as "reconstruction." Condominium B's discriminant score was smaller than A, presenting a positive value of 0.2805, with a discriminant result also as "reconstruction." Condominium C was the only case with a negative value for the discriminant score of −1.090 and showing a predicted value for the discriminant result as "repair and renovate."

In this way, a discriminant result can be obtained by only substituting the necessary data into the discriminant equation.

15.5 Interpretation of the Results

15.5.1 The Size of Independent Variables and the Positive or Negative Discriminant Equation

The discriminant equation (Eq. (15.1)) was obtained in Sect. 15.3.2. This equation shows that, of the discriminant coefficients, only a2, the previous total floor area, has a negative value, while the other three coefficients have positive values. It can be inferred if the entire Eq ((15.1) is a negative, the discriminant will be "repair and

Table 15.13 Discriminant results

Apartment	A	B	C
Discriminant score	0.6135	0.2805	−1.090
Current status	In residence	In residence	In residence
Predicted value	Rebuilding	Rebuilding	Repair restoration

renovate" (not reconstruction) and the value of the previous total floor area becomes larger, i.e., the larger the scale of the condominium, the more difficult the reconstruction becomes. Conversely, if the three independent variables other than total floor area become larger, it means an increase in the possibility of reconstruction.

Similarly, the relationship between the size of each independent variable and the positive or negative Eq. ((15.1), i.e., whether it is "reconstruction" or "repair and renovate," is summarized below:

(a) Change in the floor area ratio, i.e., in terms of what level of increase is allowed by law. The larger the value, the greater the possibility of reconstruction.
(b) The larger the total floor area, i.e., the larger the scale of the condominium, the smaller the possibility of reconstruction.
(c) In terms of the previous plot floor area, i.e., the larger the area of the plot, regardless of the size of the building, the greater the possibility of reconstruction.
(d) In terms of the appraisal value of the land for each dwelling derived from the previous total floor area for each dwelling, i.e., the higher the appraisal value, the greater the probability of reconstruction.

There is past research that reported similar results of (a) to (d), but an outcome of this research is the clarification of the respective weightings for the relationship among the four variables.

15.5.2 Rearrangement of the Analysis Model

Up until now, we have used the analysis model (1) in Table 15.1 that refers to "reconstruction" and "repair and renovate," and the ability to obtain a similar result based on slightly different data would signify the analysis results as stable. So, as indicated in Sect. 15.2, we looked at variations such as discriminant coefficient and predictive ratio when there is partial change to the analysis model.

"Reconstruction" can be changed to subsets of the Facilitation Act and equivalent exchange, while "repair and renovate" can be changed to earthquake resistance renovation and large-scale repair. Discriminant analysis of these was conducted with analysis models (2) to (6), as the combinations indicated in Table 15.14. For example, explaining in relation to "(5) the Facilitation Act × large-scale repair," facilitation is a subset of reconstruction, while large-scale repair is a subset of repair and renovate and a discriminant equation as the predicted results of such data can be derived. Note that like Sect. 15.3, it is confirmed by inspection that this is likely to be statistically certain.

As shown in Table 15.14, common independent variables are indicated as "change in the floor area ratio," "the previous total floor area," and "the previous plot area" for the discriminant equation in all analysis models. In addition, according to the difference in the analyzed model, the discriminant coefficients have the same positive or negative sign for all even though there are differences in the values. This indicates how it conforms to what was noted in the aforementioned (a) to (c).

Table 15.14 List of the values of the discriminant equations and predictive ratios when viewed by analysis model

Analysis model	(1) Reconstruction X repair · restoration	(2) Reconstruction X large-scale restoration	(3) Reconstruction X seismic resistant repair	(4) Uninterrupted method X repair · restoration	(5) Uninterrupted method X large-scale restoration	(6) Uninterrupted method X seismic resistant repair
Discriminant test	**	**	**	**	**	**
Discriminant constant	−0.116	−1.33	0.508	0.54	1.80	1.13
Increase and decrease of volume ratio	0.069	0.0075	0.0082	0.0055	0.0075	0.0075
Previous floor area	−0.00031	−0.00061	−0.00038	−0.00029	−0.00047	−0.00034
Previous site area	0.00018	0.00037	0.00021	0.00020	0.00027	0.00022
Evaluation sum for previous housing land division	0.00018					
Previous total floor area/number of dwelling units		0.02171				
Medium level of reconstruction	92.8%	96.3%	94.0%	88.5%	90.2%	90.2%
Discriminant medium rate	89.4%	89.9%	88.9%	87.0%	85.9%	85.7%
Certainty of misclassification	15.3%	11.9%	13.9%	18.0%	15.3%	16.9%
Correlation ratio	0.494	0.494	0.446	0.457	0.465	0.428

**: $p < 0.01$

Furthermore, as evidenced above, there is the possibility that the four common independent variables mentioned are in fact proxy of some other variables, requiring further investigation.

15.6 Concluding Remarks

15.6.1 Conclusion

This paper can be summarized by the following five points:

1. This paper verified whether the feasibility of possible reconstruction could be evaluated on the basis of previous real estate data alone without touching on the reconstruction process.
2. A discriminant analysis was conducted collecting real estate data for the aforementioned purpose and taking "reconstruction" or "repair and renovate" as the objective variables.
3. As a result, in the learning process, "reconstruction" could be identified with a predictive ratio of 89.4%. In addition, a discriminant equation was obtained consisting of four independent variables, i.e., the total floor area (scale of the condominium), the plot area (size of the plot), change in the floor area ratio (the extent to which there can be increased construction), and the previous appraisal value of land for each dwelling (asset appraisal value for the land obtained from the market land value in the vicinity).
4. Substitution of data for three examples of not yet reconstructed properties into the above discriminant equation was used to generate respective discriminant results.
5. When a discriminant analysis was conducted using an analysis model that is a subset by expanding it beyond (3) above, there were three independent variables for all of the models, that is, total floor area, plot area, and change in floor area ratio, were listed as independent variables.

15.6.2 Conclusion

Therefore, as indicated in the preceding paragraphs (3) and (4), the first purpose of answering the proposition of "It is possible to identify from the past" using real estate data was confirmed that it was possible. In other words, by first analyzing real estate data, it was feasible to confirm reconstructed condominiums out from the reconstructed condominiums and the renovated condominiums. In addition, it was also concluded that this could be quantified. In addition, regarding the second purpose concerning the question of "What combination of independent variables determines reconstruction," it was indicated from the preceding paragraphs (3) and (5) that four or three independent variables can be selected for many analysis models.

Therefore, we can judge that the purpose was also achieved on this point.

15.6.3   Issues and Outlook

As explained in Sect. 15.2.2, the data targeted for this analysis was adequate for comparative analysis purpose of the repair and renovate group with the reconstruction group, but it cannot be used to have any specific area representing all others. However, if one wants to calculate the number of condominiums that are possible for reconstruction from the number of deteriorated condominiums in City D, for example, the feasibility evaluation would be difficult just from the results obtained here. This is because the population in this paper (1) differs from the case of City D. To overcome this, it is necessary to select a more general population than the "repair and renovate" group used here.

Furthermore, this time, the analysis was conducted with virtually no consideration given to the attributes of the data in relation to the main human causes such as the approach of the management association and the age breakdown of residents. These must be incorporated in the future.

In addition, it has also been pointed out that consideration needs to be given to the possibility of other independent variables such as the prices of existing properties on the verge of reconstruction. It was not possible to reflect this due to the inability to prepare the data this time, but a major issue for the future is also the clarification of the relationship between the variety of covariates and the accuracy of prediction.

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Chapter 16
Factor Analysis of Rent Using Space Syntax Measures: Comparative Analysis by Building Use around Shibuya Station

Akira Ota, Hiroshi Takahashi, and Toshiyuki Kaneda

Abstract The determinants of residential, office and commercial rent are each analyzed by taking the 10 min walking distance area around Shibuya Station in Tokyo as the research target area. Conventional physical and quantitative factors such as distance from the nearest station, the width of the frontal road, age of the building, the number of floors, total floor area, contracted floor area, building structure etc. are included in the multiple-regression analysis as well as qualitative factors such as the visible area representing visibility on a main street and the integration value representing street network centrality—easy accessibility from other locations such as any intersection points—based on the space syntax measures (SS measures) used in the analysis by Jake Desyllas from University College of London. It is shown that both SS measures affect the rent for all the residential, office and commercial uses with the statistically significant level of 5%. It is quantitatively confirmed that the residential rent increases in a secluded location, and the office and commercial rent rise in a location with high street network centrality and good access, which would suggest that the SS measures are crucial important rent factors for residential, offices, and commercial uses in other places in Japan.

Keywords Rent · Building and location factors · Space syntax measures · Visible area · Street network centrality · Building use location

A. Ota (✉) · H. Takahashi
Keio University, Kanagawa, Japan
e-mail: akira_ota@keio.jp; htaka@kbs.keio.ac.jp

T. Kaneda
Nagoya Institute of Technology, Aichi, Japan
e-mail: kaneda@nitech.ac.jp

16.1 Introduction

16.1.1 Research Background and Objectives

Even though the location of a property is an important factor in the real estate business, it is difficult to evaluate location quantitatively. It is commonly considered that the advantages and disadvantages of a location are reflected in the rent and land price of a building; therefore, to better understand the location valuation, it is potentially meaningful to analyze rent factors using the quantified measures of a location.

Candidate factors in previous rent factor analysis have been broadly divided into two types of attribute: location and building. Location attributes have included distance from the nearest station, the width of the frontal road, surrounding facilities, and the like, and building attributes have included age of the building, the number of floors, total floor area, contracted floor area, and the like. As possible location valuation factors, macro-factors include stations, railway lines, the type of district and its public image, etc. (Osaragi and Ogawa 2004), and micro-factors include walking distance from any stations, surrounding facilities, etc.

Regarding the location as micro-factors, generally, the best suited locations for properties differ depending upon the use; for residential property, a secluded and quiet spot is preferred rather than a noisy place on a main street and, conversely, for office and commercial property, a location with high visibility on a main street or with easy accessibility from other locations, such as any intersection points, with a high degree of street network centrality. Therefore, it is known that a variety of micro-location attributes affect the rent; however, they have been regarded as qualitative factors, and little is taken into account as rent factors. Each building use, such as residential, offices, or commercial, has its own best suited location, which is possible to clarify through quantitative location valuation.

As a method to analyze micro-location attributes, a group from University College London proposed space syntax (hereinafter, SS) theory (Hillier and Hanson 1984). This theory is known as a means to establish an urban spatial configuration as a quantitative measure. Through visibility graph analysis, an analytic technique based on SS theory, two measures—the visible area representing visibility and the integration value representing street network centrality (hereinafter, SS measures)—are calculated, and the effect of their addition to rent factors is examined.

Centering on Shibuya Station in Tokyo Metropolis, a circular area with a radius corresponding to a maximum 10-min walk from the station was set as the research target area. To examine the factors for residential, office, or commercial rent, this paper conducted multiple regression analysis by adding two SS measures, visible area and integration value, to the following candidate factor variables:

Building attributes: building age, floor number, number of stories, contracted floor area, and three dummies: ground floor, south-facing, and building structure.

Location attributes: distance from the station and one dummy concerning the accessibility of two stations.

Factor variables found to be significant in a *t*-test were selected, and while examining the applicability of the models, the factor ranking was considered according to the level of the absolute *t* value for a factor variable. The obtained multiple regression models for each building use were compared to clarify the rent factors for residential, offices, and commercial; and the influence of location valuation quantified by the SS measures on each building use was explored.

16.1.2 Prior Research on Rent Factor Analysis

We first examined earlier Japanese reports on rent factor analysis published by the Architectural Institute of Japan, the City Planning Institute of Japan, and Japan Association for Real Estate Sciences and then classified the explanatory variables into location attributes and building attributes (Table 16.1). Takeshita et al. conducted time-series analysis in 2006 for office rents in Osaka City using the distance from the station, road width, and other factors as location attributes and the number of stories, floor area, and other factors as building attributes, and the coefficient of determination was 0.713 (Takeshita and Nakamura 2006). Takizawa et al. conducted analysis by adding sensitivity evaluation of office buildings as a measure to conventional location and building attributes, and the coefficient of determination was 0.89 (Takizawa et al. 2008a). In the analysis for residential rents, by using graph mining, Takizawa et al. added the actual position of any room(s) to building attributes, and the multiple correlation coefficient was 0.876, and the coefficient of determination was 0.767 (Takizawa et al. 2008b). For commercial rents, Ishii et al. conducted analysis by adding the level of recognition of a street (hereinafter, street familiarity) to the location attributes, and the maximum coefficient of determination was 0.88 for Urawa City (Ishii et al. 2015).

Japanese research in recent years has reported factor analysis in which sensitivity evaluation of such factors as the exterior or entrance, internal configuration, actual position of room(s), or the like are added to the conventional building attributes; however, regarding location attributes, apart from the street familiarity, conventional factors have been used for analysis, and the visible area and integration value of the SS measures have never been used. The previous factor analysis using the SS measures often targeted pedestrians (e.g., Araya et al. 2005; Ueno and Kishimoto 2008), but analysis has been made using land price measures, which have a correlation with rent, and it was found the SS measures were significant in a statistical test (Ota and Kaneda 2015).

In an overseas research, in 1999, Desyllas reported factor analysis for office rents in which the SS measures were added to the location attributes (Desyllas 1999). In this report, in West Berlin between 1991 and 1997, in addition to the start month/year of the lease, the integration value ($t = 6.145$, $p < 0.0001$), which is an SS measure, was also found statistically significant, and the coefficient of determination was 0.663. Similarly, for the whole of Berlin, it was found the next statistically significant factor after the start month/year of the lease was the integration value

Table 16.1 Prior research on rent factor analysis

No	Reference name	Area	Number of samples	Study period	Coefficient of determination	Objective variable	Explanatory variables (location attributes)	Explanatory variables (building attributes)	Explanatory variables (others)	Authors
3	The time series analysis of determining factors in new office rent index	Osaka	740	1985–2004	0.713	Office rent	Road width[a], distance to Midousuji, distance to Nearest Station, distance to Osaka Station, number of lines in station, road continuity dummy[a], road dummy (Midousuji and 3 main roads), ratio of commercial building[a]	Number of stories, Total floor area, ratio of common area	Employment density, occupancy rate	Takeshita and Nakamura (2006)
4	Rent analysis of office buildings in Shinbashi considering	Tokyo (Shinbashi)	51	2005	0.89	Office rent unit price	Play facilities, surrounding environment	Total floor area, building age, comprehensive evaluation, exterior[a], building[a]	Street value	Takizawa et al. (2008a)

#	Aim	City	N	Year	Value	Dependent variable	Location variables	Building variables	Notes	Reference
	Kansei judgement									
5	Applying graph mining to rent analysis considering room layouts	Kyoto	996	2006	0.767	Residential rent (offer price)	[b]Time to station, distance from facilities, Nearest Station	[b]Building age, floor area, room area, number of stories, internal configuration, type of building, structure, direction, attached facilities, position of room	tenants on ground floor, elevator[a], standard floor	Takizawa et al. (2008b)
6	Analysis of the relationship between recognition of the names of streets and rents as well as land prices based on the correlation with the numbers of pedestrians	Fukuok	Unknown	2014	0.05	Commercial rent unit	Time to station[a]	Floor number, building age[a]		Ishii et al. (2015)
		Tenjin			0.47	Price (offer price)	Road width, street familiarity (twitter)	Floor number, building age, number of stories[a]	Pedestrians on weekend	
		Saitama			0.62		Time to station, street familiarity (twitter), road width[a]	Floor number, number of stories, building age[a]		
		Omiya			0.46		Street familiarity (Google)	Floor number		
		Urawa			0.88		Road width, street familiarity	Number of stories, floor number[a]	Pedestrians on weekday	

(continued)

Table 16.1 (continued)

No	Reference name	Area	Number of samples	Study period	Coefficient of determination	Objective variable	Explanatory variables (location attributes)	Explanatory variables (building attributes)	Explanatory variables (others)	Authors
							(Google)[a], time to station, street familiarity (twitter)			
		Hamamatsu			0.61		Time to station	Floor area, building age, floor number	Pedestrians on weekend[a]	
		Kumamoto			0.45		Sidewalk width, time to station[a]	Floor number, floor area, building age		
		Takamatsu			0.23		Time to station	Floor area, floor number[a]		

[a]It's not significant at a 5% level in a t-test

[b]It's unknown at level in a t-test

($t = 9.354$, $p < 0.0001$), with a coefficient of determination of 0.481 (Desyllas 2000). In regard to commercial rents, in 2010 Netzell conducted analysis using the SS measures for the center of a downtown area in Stockholm, and in addition to the intensity of commercial use, and discounted rent and district dummies, the integration value ($t = 2.3$, $p < 0.0005$) was found statistically significant, and the coefficient of determination was 0.65 (Netzell 2010).

Overseas, rent factor analysis using SS measures has been reported, demonstrating a certain degree of effectiveness; however, to date, no such analysis has been reported in Japan. In fact, even overseas, no case study exists in which rent factor analysis of residential, office, and commercial uses has been conducted for the same district and factors compared for each use.

16.2 Rent Data as an Explained Variable

16.2.1 Collection of Rent Data and Target Area

The residential, office, and commercial rent data (hereinafter, rent data) used in this research were taken from the Real Estate Information Network Systems (hereinafter, REINS), and those cases where a contract was made during the 2 years from June 1, 2014, to May 31, 2016, were extracted and analyzed. In general, real estate agents share real estate information through REINS and provide it to their clients, usually individuals or medium and small enterprises. Among the abovementioned contracts in Tokyo Metropolis, the average lease square measure for office and commercial use is 64 m^2, and the contracts are for relatively small-size properties. The districts within 10 min of each station on the JR Yamanote Line in the center of Tokyo Metropolis are easily accessible to numerous train passengers. They have a high number of lease contracts, which were classified by use into residential, offices, or commercial (Table 16.2). The primary use of each district was established according to the number of contracts; however, since this research aims to understand rent factors for residential, office, and commercial use, Shibuya Station with a high number of contracts for all uses was selected as the target. The number of contracts was 500 residential, 575 offices, and 358 commercial. Commercial with residential and commercial with office facilities were classified as commercial properties.

16.2.2 Rent Data as an Explained Variable

This research excluded rental offices under special contract conditions and small-scale offices of about 3 tsubo or 9.9 m^2 or below that could be shared offices. When several contracts were found in the same building, only the contract with the lowest-priced rent was adopted, the other contracts excluded. Any contracts with imperfect data, such as a non-specific address or inconsistent property name and address, were

Table 16.2 Number of contracts for residential, office, or commercial properties in station districts on the Yamanote Line (June 1, 2014, to May 31, 2016)

	Tokyo	Yurakucho	Shinbashi	Hamamatsucho	Tamachi	Sinagawa
Residential	66	11	188	264	800	243
Offices	108	54	532	209	220	28
Commercial	32	115	214	36	47	5
	Osaki	Gotanda	Meguro	Ebisu	Shibuya	Harajuku
Residential	697	613	820	788	500	233
Offices	49	154	77	115	575	216
Commercial	7	54	42	86	358	174
	Yoyogi	Shinjuku	Shin-okubo	Takadanobaba	Mejiro	Ikebukuro
Residential	500	566	1116	1415	688	2263
Offices	194	470	73	211	34	617
Commercial	100	370	94	141	25	562
	Otsuka	Sugamo	Komagome	Tabata	Nishinippori	Nippori
Residential	1680	1194	1347	1020	1079	1010
Offices	103	37	26	11	52	56
Commercial	126	54	53	20	43	60
	Uguisudani	Ueno	Okachimachi	Akihabara	Kanda	
Residential	600	419	422	479	292	–
Offices	36	171	427	630	529	–
Commercial	31	77	112	142	95	–

also excluded, which reduced the number of contract samples to 189 residential, 177 offices, and 143 commercial.

For the rent data as an explained variable, rent unit price/tsubo (approx. 3.3 m^2) was used. This unit price was calculated as follows: any service and communal charges were added to the rent, and the total is divided by the contracted floor area (tsubo). In addition, residential rent was tax-free, but office and commercial rent included consumption tax.

16.3   Candidate Factor Variables

16.3.1   Space Syntax Measures

SS theory is a general term for the method of the spatial configuration analysis proposed by Hillier et al. of University College London in the early 1980s. This research conducted the visibility graph analysis in the SS theory and used DEPTHMAP software to calculate the SS measures. On a map, grids were laid out at intervals of 4 m, which is the Building Standards Act requirement for road width, and any grid square where more than half of the area is occupied by a street was marked. When no screen was found between the center of a marked grid square and the center of another grid square, it was assumed that both grid squares were visible to each other and the number of visible grid squares was counted. In DEPTHMAP, the total number of grid squares that can be seen from a grid square at a certain point is called "connectivity" and represents the square measure of the visible area (Turner 2004).

In addition, a measure, Integration Value (hereinafter, IV), known as a means of indicating the street network centrality, was also prepared. The IV indicates the intensity of spatial connection in a street network, and a higher value means high street network centrality and inadequate depth. Firstly, a topological distance between a certain two points (grids) is called Depth, and the Depth is calculated as the least number of steps between one point and another point. Then, the total value of each Depth from one point to all other points is leveled off by the number of all points, and this leveled value is called the Mean Depth (hereinafter, MD). Using the MD, Relative Asymmetry (hereinafter, RA) (Eq. 16.1) is found, which is the relative depth of each point (grid) seen from the entire area. When the RA value is higher, it is considered that many spaces must be traversed and the relevant space is positioned at a deep and complex location. However, since the RA is affected by k, the total number of grids, a Real Relative Asymmetry (hereinafter, RRA) is found (Eq. 16.3), which is a value standardized by a correction coefficient Dk determined by only k (Eq. 16.2). The inverse number of the RRA value is an IV (Eq. 16.4) (Sayed et al. 2014):

$$RA = \frac{2(MD - 1)}{k - 2} \tag{16.1}$$

$$D_k = \frac{2\left[k\left\{\log_2\left(\frac{k+2}{3}\right) - 1\right\} + 1\right]}{(k - 1)(k - 2)} \tag{16.2}$$

$$RRA = \frac{RA}{D_k} = \frac{(MD - 1)(k - 1)}{\left[k\left\{\log_2\left(\frac{k+2}{3}\right) - 1\right\} + 1\right]} \tag{16.3}$$

$$IV = \frac{1}{RRA} \tag{16.4}$$

In regard to IV, a scope for analysis can be specified, and in general, two types of values are used: Local Integration Value (hereinafter, LIV3), an IV limited to Depth 3, and Global Integration Value (hereinafter, GIV), which covers the entire area. In this research, since the center of the Metropolis, an extensive scope, was to be handled, GIV for the streets of the entire area was measured.

16.3.2 Spatial Distribution of Space Syntax Measures

The two SS measures, visible area and integration value (IV), were found by visibility graph analysis of the streets in the 2-km radius circle centering on Shibuya Station. Those contracts as samples found within a 10-min walk (800-m radius) circle were extracted, but since the SS measures show a tendency for the value to increase toward the center of a target area, a buffer zone of 1200 meters was applied to create the larger 2-km radius target area.

The Shibuya Station 2-km circle covers an area comprising nearly up to Kita-sando Station to the north, Gaien-Nishi-dori Street to the east, Ikejiri-Ōhashi Station to the west, and Meguro-dori Street to the south. Figures 16.1 and 16.2 show spatial distribution maps of the found visible areas and integration values.

The spatial distribution map of the visible areas (Fig. 16.1) shows higher values along National Highway Route 246. The highest value was found in the vicinity of the Shibuya Station east side, which has a linear unobstructed view of National Highway Route 246. Higher values also tended to be found on other streets with larger widths.

The spatial distribution map of the IV (Fig. 16.2) shows a similar trend to the visible areas, where generally, any street with a broad width had a high value; however, these values were not conspicuously high, and with the IV, it can be read that the variation among points with high and low values was smaller compared to the visible areas.

Fig. 16.1 Visible area spatial distribution map in the Shibuya Station 2-km radius circle

16.3.3 Other Candidate Factor Variables

This section explains other candidate factor variables that were used. As building attributes, the following were included: floor number, number of stories, building age, contracted floor area, and three dummies—ground floor, south-facing, and building structure. The ground floor dummy is a dummy variable of whether or not the floor number is the ground floor, and the south-facing dummy is a dummy variable of whether the balcony faces south, southeast, or southwest. For the building structure dummy, steel-frame structure or RC (reinforced concrete) structure was used as a dummy variable. Since there were no office or commercial contracts with wooden structures, the classification was excluded. For the location attributes, the distance from the station was obtained by measuring the shortest walking distance from Shibuya Station, which is the terminal station. Moreover, in addition to Shibuya Station, the circular area also includes Omotesandō, Harajuku, Meiji-jingumae, Shinsen, Ebisu, and Daikanyama Station, and when a property was also located within a 10-min walk from one of these stations, a dummy variable for the accessibility of two stations was used.

Fig. 16.2 IV spatial distribution map in the Shibuya Station 2-km radius circle

16.4 Examination of Rent Factors Using Space Syntax Measures

16.4.1 Correlation Matrix Between Rent Unit Prices and Candidate Factor Variables and VIF

Tables 16.3, 16.4, and 16.5 show the correlation coefficients R between the rent unit prices of residential, offices, and commercial properties and candidate factor variables (lower left half) and variance inflation factors (hereinafter, VIF) (upper right half). The values exceeding the correlation coefficient absolute value 0.4, which is regarded as a slightly high correlation, were shaded. VIF was calculated using Eq. (16.5) (shown below), and it is considered as a measure of suspected multicollinearity (Marquardt 1970).

Table 16.3 Correlation coefficients between residential rent unit price and candidate factor variables and VIF

VIF / Correlation	(Y) Rent unit price	(X1) Distance from the station (m)	(X2) two stations dummy	(X3) Visible area	(X4) Integration Value	(X5) Floor number	(X6) Ground floor dummy	(X7) Contracted floor area	(X8) South-facing dummy	(X9) Number of stories	(X10) Building age	(X11) Steel-frame dummy	(X12) RC dummy
(Y) Rent unit price (Yen / Tsubo)		1.033	1.004	1.002	1.018	1.012	1.001	1.002	1.005	1.032	1.316	1.004	1.020
(X1) Distance from the station (m)	−0.178		1.168	1.002	1.005	1.083	1.026	1.030	1.006	1.160	1.007	1.001	1.002
(X2) two stations dummy	−0.064	0.380		1.004	1.001	1.002	1.006	1.000	1.009	1.002	1.012	1.000	1.002
(X3) Visible area	−0.049	−0.043	−0.063		1.603	1.023	1.012	1.000	1.013	1.098	1.006	1.006	1.003
(X4) Integration Value	−0.132	−0.068	0.029	0.613		1.077	1.046	1.002	1.039	1.174	1.001	1.010	1.000
(X5) Floor number	0.109	−0.278	0.044	0.148	0.268		1.154	1.000	1.014	2.302	1.000	1.030	1.014
(X6) Ground floor dummy	−0.037	0.160	0.077	−0.110	−0.209	−0.365		1.004	1.020	1.090	1.024	1.081	1.010
(X7) Contracted floor area (Tsubo)	0.044	0.170	−0.002	0.015	0.042	0.018	0.065		1.006	1.000	1.004	1.006	1.001
(X8) South-facing dummy	−0.073	−0.078	0.095	0.112	0.193	0.118	−0.141	0.078		1.012	1.003	1.001	1.002
(X9) Number of stories	0.176	−0.371	−0.040	0.299	0.385	0.752	−0.288	−0.022	0.109		1.008	1.049	1.032
(X10) Building age (Years)	−0.490	−0.082	−0.110	−0.075	0.030	0.000	−0.154	−0.061	0.050	−0.091		1.001	1.027
(X11) Steel-frame dummy	−0.064	0.023	−0.020	−0.076	−0.099	−0.170	0.274	−0.074	−0.027	−0.217	−0.037		1.140
(X12) RC dummy	0.141	0.048	0.042	−0.054	−0.022	−0.118	−0.098	0.035	0.046	−0.177	−0.162	−0.351	

$$\text{VIF} = \frac{1}{\left(1 - R^2\right)} \tag{16.5}$$

Regarding the correlation between the rent unit price and candidate factor variables, the following factor variables showed a slightly high correlation with the rent unit price: residential, building age (−0.490); offices, contracted floor area (0.459) and building age (−0.424); and commercial, ground floor dummy (0.456).

Regarding the correlation between candidate factor variables, in residential, the floor number and number of stories had a high correlation (0.752), and the visible area and IV showed a slightly high correlation (0.613). In offices, a slightly high correlation was seen between the following pairs: the visible area and IV (0.671), the floor number and number of stories (0.602), the number of stories and RC dummy (−0.502), and the number of stories and IV (0.463). In commercial properties, a slightly high correlation was found between the following pairs: the visible area and

Table 16.4 Correlation coefficients between office rent unit price and candidate factor variables and VIF

VIF \ Correlation	(Y) Rent unit price	(X1) Distance from the station	(X2) two stations dummy	(X3) Visible area	(X4) Integration Value	(X5) Floor number	(X6) Ground floor dummy	(X7) Contracted floor area	(X8) South-facing dummy	(X9) Number of stories	(X10) Building age	(X11) Steel-frame dummy	(X12) RC dummy
(Y) Rent unit price (Yen / Tsubo)		1.116	1.026	1.010	1.058	1.038	1.001	1.266	1.001	1.029	1.219	1.037	1.035
(X1) Distance from the station (m)	−0.323		1.177	1.041	1.094	1.102	1.024	1.004	1.002	1.059	1.012	1.004	1.013
(X2) two stations dummy	−0.158	0.388		1.004	1.004	1.010	1.022	1.007	1.000	1.001	1.000	1.009	1.001
(X3) Visible area	0.101	−0.198	−0.062		1.818	1.071	1.000	1.000	1.003	1.132	1.008	1.001	1.054
(X4) Integration Value	0.235	−0.292	−0.059	0.671		1.156	1.000	1.015	1.001	1.274	1.006	1.000	1.109
(X5) Floor number	0.191	−0.305	−0.097	0.258	0.367		1.116	1.027	1.002	1.569	1.008	1.024	1.142
(X6) Ground floor dummy	−0.035	0.154	0.146	0.015	0.020	−0.322		1.000	1.040	1.003	1.000	1.001	1.001
(X7) Contracted floor area (Tsubo)	0.459	−0.067	−0.083	−0.002	0.121	0.162	0.021		1.000	1.022	1.034	1.002	1.032
(X8) South-facing dummy	−0.037	0.040	0.012	−0.055	−0.030	−0.041	0.197	−0.016		1.000	1.000	1.000	1.002
(X9) Number of stories	0.168	−0.237	0.030	0.342	0.463	0.602	−0.057	0.148	−0.010		1.015	1.045	1.336
(X10) Building age (Years)	−0.424	−0.108	0.019	0.087	0.079	0.088	−0.008	−0.182	−0.015	0.122		1.030	1.000
(X11) Steel-frame dummy	0.189	−0.064	−0.093	−0.022	0.019	−0.153	0.031	−0.048	0.022	−0.207	−0.171		1.077
(X12) RC dummy	−0.184	0.112	−0.028	−0.226	−0.313	−0.353	−0.026	−0.175	−0.047	−0.502	0.002	−0.267	

IV (0.671), the number of stories and RC dummy (−0.508), the distance from the station and IV (−0.491), the floor number and ground floor dummy (−0.449), and the number of stories and IV (0.433).

16.4.2 Examination of Models of the Multiple Regression Analysis Results

Similarly, to the prior research, multiple regression analysis was conducted for each use, and factors that were significant at a 5% level in a *t*-test were selected, and Tables 16.6, 16.7, and 16.8 show the results. In model selection, the stepwise

Table 16.5 Correlation coefficients between commercial rent unit price and candidate factor variables and VIF

VIF \ Correlation	(Y) Rent unit price	(X1) Distance from the station	(X2) two stations dummy	(X3) Visible area	(X4) Integration Value	(X5) Floor number	(X6) Ground floor dummy	(X7) Contracted floor area	(X8) South-facing dummy	(X9) Number of stories	(X10) Building age	(X11) Steel-frame dummy	(X12) RC dummy
(Y) Rent unit price (Yen / Tsubo)		1.035	1.002	1.004	1.062	1.064	1.262	1.003	1.006	1.001	1.030	1.014	1.014
(X1) Distance from the station (m)	−0.184		1.146	1.122	1.317	1.151	1.097	1.000	1.007	1.061	1.018	1.002	1.070
(X2) two stations dummy	−0.043	0.357		1.005	1.015	1.024	1.034	1.004	1.012	1.010	1.010	1.003	1.005
(X3) Visible area	0.060	−0.330	−0.073		1.820	1.040	1.000	1.001	1.005	1.101	1.021	1.002	1.091
(X4) Integration Value	0.242	−0.491	−0.121	0.671		1.064	1.005	1.001	1.029	1.231	1.041	1.022	1.188
(X5) Floor number	−0.245	−0.362	−0.154	0.196	0.245		1.252	1.003	1.043	1.176	1.003	1.011	1.083
(X6) Ground floor dummy	0.456	0.297	0.180	−0.010	−0.069	−0.449		1.002	1.007	1.009	1.014	1.007	1.005
(X7) Contracted floor area (Tsubo)	0.058	−0.016	0.060	0.033	0.037	0.055	−0.041		1.008	1.020	1.000	1.008	1.047
(X8) South-facing dummy	−0.077	−0.082	−0.108	0.071	0.167	0.202	−0.086	−0.091		1.008	1.000	1.005	1.006
(X9) Number of stories	−0.024	−0.241	−0.099	0.303	0.433	0.387	−0.095	0.139	0.087		1.019	1.000	1.348
(X10) Building age (Years)	−0.171	−0.131	−0.099	0.143	0.199	0.054	−0.115	0.013	0.003	0.137		1.011	1.008
(X11) Steel-frame dummy	0.119	−0.049	0.054	0.046	0.146	−0.106	0.083	−0.091	0.069	0.010	−0.103		1.144
(X12) RC dummy	−0.116	0.256	0.069	−0.289	−0.398	−0.276	0.070	−0.212	−0.079	0.508	−0.092	−0.355	

Table 16.6 Multiple regression analysis results: residential rent

Coefficients of determination: 0.305		AIC: 3423.13		
	Partial regression coefficient	Standard partial regression coefficient	t value	p value
Constant	19,860	–	0.000	1.000
(X10) Building age	−272	−0.505	−8.204	0.000
(Xl) Distance from the station	−86	−0.228	−3.698	0.000
(X4) Integration value	−13,913	−0.132	−2.155	0.032

Table 16.7 Multiple regression analysis results: office rent

Coefficients of determination: 0.475		AIC: 3353.37		
	Partial regression coefficient	Standard partial regression coefficient	*t* value	*p* value
Constant	18,430	–	0.000	1.000
(X10) Building age	−144	−0.380	−6.554	0.000
(X7) Contracted floor area	81	0.359	6.277	0.000
(X1) Distance from the station	−494	−0.293	−5.015	0.000
(X4) Integration value	23,414	0.134	2.284	0.024
(X11) Steel-frame dummy	1791	0.120	2.108	0.036

Table 16.8 Multiple regression analysis results: commercial rent

Coefficients of determination: 0.367		AIC: 2994.94		
	Partial regression coefficient	Standard partial regression coefficient	*t* value	*p* value
Constant	19,698	–	0.000	1.000
(X6) Ground floor dummy	13,556	0.530	7.396	0.000
(Xl) Distance from the station	−1123	−0.278	−3.406	0.001
(X10) Building age	−150	−0.181	−2.610	0.010
(X4) Integration value	75,878	0.178	2.254	0.026

variable increase and decrease method was applied, and any model with the minimum value of Akaike's Information Criterion (hereinafter, AIC) was selected.

The coefficient of determination of each rent model was as follows: residential, 0.305; offices, 0.475; and commercial, 0.367, and in the variance analysis of the multiple regression equation, all uses showed a significant level of 1%.

In those analysis models excluding the SS measures from the candidate factors, the coefficients of determination of residential, offices, and commercial were 0.288, 0.471, and 0.343, respectively, and AIC were 3425.82, 3354.55, and 2998.11. AIC of the models using the SS measures were lower for all uses, which confirmed that the SS measures improved the multiple regression models. However, our models showed lower values in comparison with the coefficients of determination of the models in earlier overseas research using the SS measures, such as 0.485 for offices in the whole of Berlin and 0.65 for commercial in downtown Stockholm.

Concerning the factor variables, in the residential rent, building age (−8.204), distance from the station (−3.698), and IV (−2.155) were adopted in the order of absolute *t* value. In the same way, in the office rent, building age (−6.554), contracted floor area (6.277), distance from the station (−5.015), IV (2.284), and steel-frame dummy (2.108) were adopted. In the commercial rent, ground floor

dummy (7.396), distance from the station (−3.406), building age (−2.610), and IV (2.254) were adopted.

In addition, by regarding each explanatory variable as an explained variable, and using all other explanatory variables, multiple regression analysis was conducted to calculate the VIF of each explanatory variable; however, it was less than 4 for all explanatory variables, and therefore it was assumed there was no doubt concerning multicollinearity, and all explanatory variables were adopted.

16.4.3 Comparison of Multiple Regression Models by Building Use

With a focus on the ranking of each factor variable, the models were compared by use. The building age ranked first in residential and offices, but third in commercial. Whereas, in commercial, the ground floor dummy ranked first. The distance from station ranked second in residential and commercial and came third in offices. In offices the contracted floor area came second. The building age and distance from the station ranked relatively high in all three uses, allowing us to read their great influence on the rent. It is possible to consider that since commercial properties are visited by an unspecified large number of customers, the ground floor dummy that is easy to recognize and access took first place. In addition, the reasons why the contracted floor area ranked second for offices could be that there is a certain level of demand to rent a substantial floor area, and a larger lease floor area means a larger company with the means to pay more rent.

Next, IV, an SS measure, took third place in residential and fourth place in offices and commercial; even though it did not rank in any higher position, it was adopted through a statistical test for all uses and showed a certain level of influence. For offices and commercial, a location with high street network centrality and allowing easy access from anywhere is preferred, whereas for residential, a secluded and quiet location with low street network centrality is favored, and this could contribute to the minus coefficient values in the table.

Moreover, for offices, the adopted steel-frame structure ranked fifth, which allows us to read the rent of a steel-frame structure building to be higher. Offices include Small Office Home Office (SOHO) where rooms are used both for residential and office, and SOHO rent tends to be lower than regular offices. Generally, a SOHO property is often a wooden detached house or in an RC structure apartment, not in a steel-frame structure. For this reason, it is possible to consider that the rent increases for a steel-frame structure, which is highly likely to be a regular office and not a SOHO.

16.4.4 Examination of Rent Factor Analysis Using the Visible Area

Since the IV and visible area had a slightly high correlation, multiple regression analysis was conducted using the visible area as a candidate factor, instead of the IV. As a result, the visible area p values were 0.118 for residential, 0.196 for offices, and 0.606 for commercial, and in all models, no significant difference at a 5% level was found for the visible areas. Particularly, it is possible to think the visible area has hardly any influence on commercial properties.

From the spatial distribution map, it was found that the visible area tended to show a higher value at a point on a street with a large width; however, National Highway Route 246 is partially occupied by an expressway and is not a busy pedestrian street, and therefore, the commercial rent unit price along National Highway Route 246 could not be so high. For this reason, the National Highway Route 246 samples (residential, 6; offices, 11; commercial, 5) were excluded, and the same analysis was conducted. Tables 16.9, 16.10, and 16.11 show the results. Moreover, regarding the spatial distribution map of visible areas, the shading scale was changed so as to allow values other than National Highway Route 246 to be read, as shown in Fig. 16.3.

The coefficients of determination of residential, offices, and commercial were 0.298, 0.473, and 0.377, respectively, and the visible area was not adopted for residential, and its p values for offices and commercial were 0.007 and 0.034,

Table 16.9 Multiple regression analysis using the visible area: residential rent

Coefficients of determination: 0.298		AIC: 3314.15		
	Partial regression coefficient	Standard partial regression coefficient	*t* value	*p* value
Constant	17,734	–	0.000	1.000
(X10) Building age	−89	−0.517	−8.257	0.000
(Xl) Distance from the station	−257	−0.215	−3.437	0.001

Table 16.10 Multiple regression analysis using the visible area: office rent

Coefficients of determination: 0.473		AIC: 3148.87		
	Partial regression coefficient	Standard partial regression coefficient	*t* value	*p* value
Constant	22,544	–	18.581	0.000
(X10) Building age	−149	−0.389	−6.635	0.000
(X7) Contracted floor area	83	0.368	6.304	0.000
(X1) Distance from the station	−545	−0.312	−5.370	0.000
(X3) Visible area	1.089	0.157	2.711	0.007

Table 16.11 Multiple regression analysis using the visible area: commercial rent

Coefficients of determination: 0.377		AIC: 2891.27		
	Partial regression coefficient	Standard partial regression coefficient	t value	p value
Constant	31,512	–	0.000	1.000
(X6) Ground floor dummy	13,634	0.527	7.308	0.000
(Xl) Distance from the station	−1341	−0.322	−4.237	0.000
(X3) Visible area	2.930	0.156	2.137	0.034
(X10) Building age	−119	−0.142	−2.049	0.042
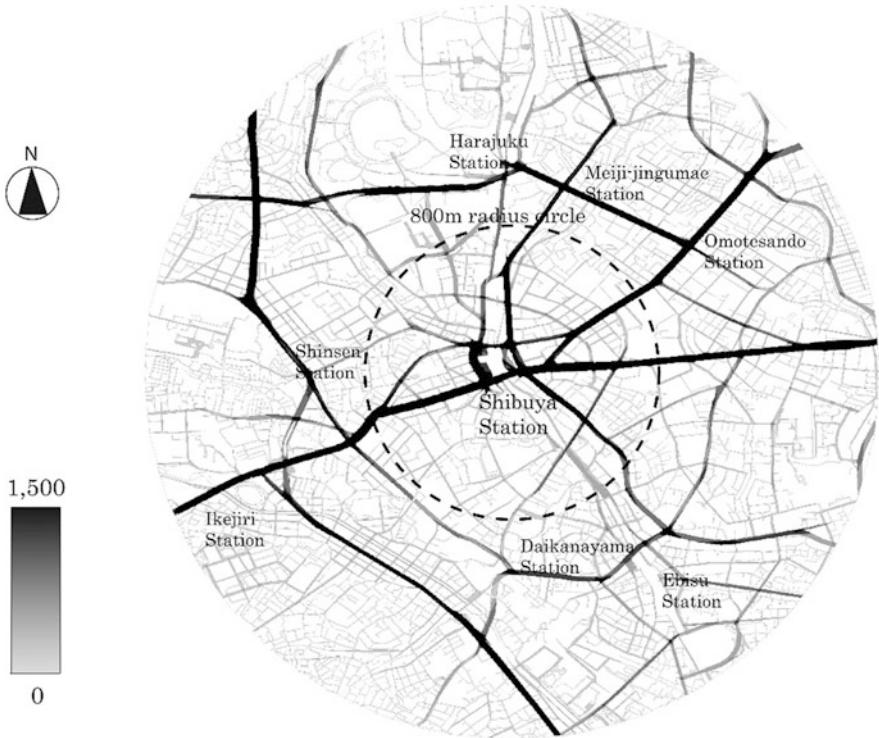
Fig. 16.3 Visible area spatial distribution map in the Shibuya Station 2-km radius circle (shading changed)

thereby confirming a significant difference at a 5% level. These results indicate that in a location with good visibility, the rent unit price for offices and commercial goes up.

16.5 Conclusion

In regard to the rent factors for residential, office, and commercial properties within the Shibuya Station 10-min walk circle in Tokyo Metropolis, multiple regression analysis was conducted. As candidate factor variables, the following building attributes were used: building age, floor number, number of stories, contracted floor area and three dummies—ground floor, south-facing, and building structure. The following location attributes were also used: distance from the station and one dummy concerning the accessibility of two stations. Two SS measures were also added: visible area representing visibility and integration value representing street network centrality.

Factor analysis for the residential rent found that in the order of absolute t value, the factors were building age, distance from the station, and integration value, and the coefficient of determination was 0.305. The factors for the office rent were building age, contracted floor area, distance from the station, integration value, and steel-frame dummy, and the coefficient of determination was 0.475. The factors for the commercial rent were the ground floor dummy, distance from the station, building age, and integration value, and the coefficient of determination was 0.367.

The integration value, an SS measure, was adopted in all uses with a significance level of 5%. For offices and commercial, a location with high street network centrality and allowing easy access from anywhere is preferred, whereas for residential, a secluded and quiet spot with low street network centrality is favored, and this could contribute to the minus coefficient values.

In another SS measure, visible area, National Highway Route 246 samples, which showed extremely high values, were excluded, and instead of the integration value, the visible area was used for analysis, and the coefficients of determination of residential, offices, and commercial were 0.298, 0.473, and 0.377, respectively, and the visible area p value for offices and commercial were 0.007 and 0.034, respectively, confirming a significant difference at a 5% level. The value of a partial regression coefficient resulted in a plus value, which confirmed that under certain conditions, in a location with good visibility, the office or commercial rent unit price goes up.

This research suggested that in Japan as well, the SS measures were rent factors for residential, offices, and commercial. In addition, based on the value of the partial regression coefficient of the integration value, which is an SS measure, it was quantitatively confirmed that the residential rent increases in a secluded location, and the office or commercial rent rises in a location with high street network centrality and good access.

Micro-locations involve many aspects that have not been quantified yet, and as tasks to be tackled in the future, the authors would like to aim at the further development of location valuation, such as techniques and measures for quantification, other than visibility and street network centrality using SS measures.

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Part III
City Planning and New Technology

Chapter 17
Introduction: City Planning and New Technology

Yasushi Asami

Abstract In Part III, titled "City Planning and New Technology," we discuss two topics, namely, compact cities and real estate technology in Japan.

Promotion of compact cities is regarded as a high priority issue in urban policies in the era of population decrease. The Act on Special Measures concerning Urban Reconstruction in 2014 was revised to institutionalize the framework for the Location Normalization Plan, a plan for local governments to build compact cities to manage population decline and aging urban infrastructure while placing less burden on environment. Three chapters are devoted to issues related to this movement. In Chap. 18, Ishikawa (2020) discusses how urban functions can be guided by residents' perspectives. To build a compact city, various day-to-day services must be placed proximal to residential areas; however, some services must be placed at a certain distance from residences because of land use restrictions. Therefore, we must determine the uses allowed in residential areas. In Chap. 19, Morimoto (2020) discusses the history of major contributions made by the development of transportation facilities to urban spread, the important role of traffic facilities to guide land use toward desirable purposes, and impact of self-driving vehicles on land use. In Chap. 20, Ogushi (2020) explains how the Location Normalization Plan in Niigata City was formed in detail.

Real estate technology refers to real estate business-related services that use new technology. Several new services based on new technology have been introduced in the field of real estate in Japan. Three chapters are devoted to issues related to real estate technology. In Chap. 21, Narimoto (2020) explains the outline of real estate technology services in Japan and identifies legal problems associated with handling of information. In Chap. 22, Nishio and Ito (2020) report on creating a sky view factor calculating system that uses Google Street View. Sky view factor is a term that refers to a configuration factor for the amount of sky in a hypothetical hemisphere. In Chap. 23, Kiyota (2020) explains the transition of neural network research and characteristics of deep learning and introduces a system that detects category

Y. Asami (✉)
The University of Tokyo, Tokyo, Japan
e-mail: asami@csis.u-tokyo.ac.jp

inconsistencies in real estate property photographs submitted by real estate companies by using deep learning and a system that detects indexes associated with ease of living based on property photographs.

Keywords City planning · Compact city · Location normalization plan · Real estate technology · Sky view factor · Deep learning

17.1 Compact Cities

In Japan, as the population decreases, the urban land area required is also reducing; however, condensing urban areas that have already spread is difficult. Once constructed, buildings cannot be immediately demolished when no longer used. Vacant land and houses are not proximal to each other but are in a mosaic; thus, reduction of the surface area of urban areas is difficult (Asami, 2014). However, if the spread of urban areas is ignored and density decreases, urban administrative services will become inefficient and burden city finances.

The revision to the Act on Special Measures concerning Urban Reconstruction in 2014 considered these aforementioned concerns and led to the institutionalization of the framework for the Location Normalization Plan, a plan for local governments to build compact cities to manage population decline and aging urban infrastructure while placing less burden on environment (Asami and Nakagawa 2018). The Location Normalization Plan defines urban function development areas, which are urban centers and the base of day-to-day living to which urban functions (medical, welfare, and commercial) are guided to and consolidated in the future, and residential development areas, which are promoted as residential areas to maintain population density despite a declining trend in population and to sustainably secure day-to-day services and communities. The Location Normalization Plan further determines priority areas in modern urban areas where urban functions must be maintained in the future. Residential development areas are arranged around an urban function development area so that urban services can be used within walking distance. The Location Normalization Plan is designed to ensure that the use of the public transit system accommodates day-to-day transportation needs.

In Chap. 18, Ishikawa (2020) discusses how urban functions can be guided by residents' perspectives. To build a compact city, various day-to-day services must be placed proximal to residential areas; however, some services must be placed at a certain distance from residences because of land use restrictions. Therefore, we must determine the uses allowed in residential areas. To do this, first, Ishikawa and Asami (2012) presented factors that explain the residents' degree of satisfaction with residences, upon which, based on Ishikawa and Asami (2013a), discussions were introduced in relation to what kind of mixed use is acceptable in areas of residence. The result showed that essential services are well accepted, but mixing residential areas with unpleasant services tended not to be tolerated. In addition, based on Ishikawa and Asami (2013b), the relationship between the degree of satisfaction

with convenience and allowances of mixed usages was shown, that is, residents dissatisfied with long distances to essential services may still not want these services near their homes.

In Chap. 19, upon reviewing the history of major contributions made by the development of transportation facilities to urban spread, Morimoto (2020) asserts that transportation has been improved to accommodate increases in traffic demand, which is a derived demand from land use. Based on this, Morimoto argues that because traffic demand decreases with declines in population, the use of traffic facilities (i.e., existing stock) is critical to appropriately guide land use toward desirable purposes. Morimoto suggests a next-generation streetcar system (Light Rail Transit: LRT) as a next-generation public transit system, which is being introduced to city development globally. In Japan, this system was introduced only in Toyama City, and Utsunomiya is a candidate city, which Morimoto describes in detail. Morimoto further discusses self-driving vehicles as a next-generation transit method with an impact on land use. Morimoto also argues that the formation of a transit transfer station between the trunk lines and feeder lines is a key aspect of creating a compact city.

In Chap. 20, Ogushi (2020) explains the formulation of the Location Normalization Plan in regional cities, looking at the case of Niigata City. In 2007, the government merged 14 municipalities to create Niigata City. Seventy percent of Niigata residents use personal vehicles for transportation; thus, their dependence on automobiles is high. In 2015, the Bus Rapid Transit, which travels on trunk roads, was introduced as a public–private partnership, and surplus drivers and buses were assigned to the areas with limited transit services in an effort to improve access within the city. Ogushi describes how, at a roundtable conference on sustainable city planning that examined the Location Normalization Plan, it was emphasized that the allocation of development areas is intended to loosely implement appropriate land use and is not mandatory. Specifically, public transit improvement garnered increasing interest, and many opinions were expressed. Ogushi highlights how because each of the 14 municipalities that had been merged originally had a different background, there were strong arguments for the uniqueness of each municipality. Thus, holding a discussion on optimizing overall land use through strategic investment in specific areas was difficult.

17.2   Real Estate Technology

Real estate technology refers to real estate business-related services that use new technology. New services, which utilize information technology, such as systems with advanced search function, systems that match providers and consumers, systems that evaluate property values, and systems that allow for online viewing via virtual reality (VR) and augmented reality, have been and are being developed as businesses.

Real estate technology has revitalized and improved the real estate business and also has the potential to fundamentally transform the industry moving forward. However, the legal system for real estate is based on traditional business styles and does not address developments in real estate technology. Thus, beyond simply technology, reform of the legal system is also required.

In Chap. 21, Narimoto (2020) explains the outline of real estate technology services in Japan and identifies legal problems associated with handling of information. The types of real estate technology services are as follows:

Matching platform services for rental, purchase, and development: These match providers and customers online, and their status as an agency based on the Real Estate Brokerage Act is ambiguous. Simple provision of information and communication of intents are not interpreted as agency. From 2017, computerization of disclosure statements (i.e., when buying and selling real estate, if a residential real estate contractor mediates by explaining important matters about the contract to the consumer, the contractor must explain these matters to the consumer) was introduced in rental agreements, but paper documents remain to be a requirement.

Property value evaluation and information retrieval services: These estimate property values by introducing information technology such as artificial intelligence. However, when financially compensated, this service could be considered property appraisal.

Crowdfunding: A system that collects funds by connecting companies and investors online. It is worth noting relationship of this system to the Act on Specified Joint Real Estate Ventures, Financial Instruments and Exchange Act, and the Act on Prevention of Transfer of Criminal Proceeds.

Data analysis services: These include store analysis provided by images captured by cameras in stores.

Business efficiency services: These support the real estate industry by improving the efficiency of information technology.

VR technology: It is a service that presents completed images by using VR technology.

Narimoto identifies information technology as essential in real estate technology but stresses that caution is necessary regarding the protection of personal information, protection of privacy, and legality of crawling.

In Chap. 22, Nishio and Ito (2020) report on creating a sky view factor calculating system that uses Google Street View. Sky view factor is a term that refers to a configuration factor for the amount of sky in a hypothetical hemisphere. With the revision to the Building Standards Act in 2003, a regulation on sky view factor was introduced to provide relaxation to setback regulations (wherein a diagonal line is drawn inside a property at a constant angle from a certain height at the border, and construction is only allowed below the line). Basically, this regulation makes building super high-rise buildings easier but can be applied to the relaxation of the setback regulation for the road in low-rise systems. The method proposed by Nishio and Ito obtains longitude and latitude from Google Street View and calculates sky view factor through image processing. In addition, the sky view factor calculation system is used to calculate sky view factors in areas with different land use, road

width, and distance from stations, and trends are reported. Although Google Street View is not a system for measuring sky view factor, it is a good example of obtaining new information provided by image processing.

In Chap. 23, Kiyota (2020) explains the transition of neural network research and characteristics of deep learning and introduces a system that detects category inconsistencies in real estate property photographs submitted by real estate companies by using deep learning and a system that detects indexes associated with ease of living based on property photographs. Kiyota provides massive datasets that include property photographs and layouts free of charge for academic purposes and reports that new research is underway.

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Chapter 18
Guiding Urban Facilities and Functions in Compact Mixed-Use Development from the Perspective of Residents

Toru Ishikawa

Abstract This article discusses the development of compact and functionally integrated urban environments from the perspective of local residents, focusing on their psychological evaluations of mixed land use and performance-based regulation. It demonstrates the significance of residents' perceptions and attitudes in the achievement of flexibility required for urban planning in a shrinking society. To promote planned concentration of various functions in an urban area in an appropriate way, as in the development of compact cities in a multi-polar network advocated by the Location Normalization Plan, it will have more importance than ever to conceive planning that takes the characteristics of both a region and its residents into account.

Keywords Residential environments · Psychological evaluation · City shrinkage · Resident adaptive planning · Performance-based regulation

18.1   City Shrinkage and Integration of Urban Functions

In Japan, a rapid decrease in the population due to a low birth rate and aging society has caused many societal problems, including a declining labor force rate, increased social security costs, and the difficulties of maintaining infrastructures. The aging population poses problems for urban planning as well, and the government tackles problems associated with urban shrinkage through the provision of compact residential environments, in a policy framework of location normalization planning.

Notably, the decreasing population brings about an increase in vacant properties and unused land lots, which leads to a decrease in the pressure of urban development. This means that the existing approach to urban planning, which is based on the idea of controlling the expansion of urban areas and regulating excessive development, may not work in a shrinking society. In response to a call for a new planning

T. Ishikawa (✉)
INIAD Toyo University, Tokyo, Japan
e-mail: toru.ishikawa@iniad.org

method, therefore, Japan's Urban Renaissance Special Measures Law advocates the concepts of "compact city planning" and "networks with public transportations," with an aim to promote the construction of compact urban areas through flexible planning that takes into account the situations and characteristics of target areas.

The development of compact urban areas, importantly, entails concentration of different urban functions in a planned and guided manner, since the concept of compact cities is based on the goal of locating various urban facilities and services within walking distance. The construction of such a planned mixed-use residential environment, however, is difficult to achieve by the existing planning method, because it intends to protect the uniformity of land use in residential environments and guarantee minimum standards of living by predetermined, omnibus regulation. That is, the systematic mixing of different land uses and concentration of urban functions does not conform to the traditional approach to planning that sets residential, commercial, or industrial areas and restricts the types of land uses permissible in each area. To respond to the requirement of flexible land use planning, a new method called performance-based regulation has been proposed, which defines technical standards for the protection of residential quality through the evaluation of performances of urban facilities (i.e., regulating the conditions of facilities that may affect surrounding environments) (National Institute for Land and Infrastructure Management 2008; Special issue of Urban Housing Sciences 2016).

What, then, is an "appropriate" degree of integration of different urban functions or an "optimal" level of compactness of an urban area? Performance-based regulation flexibly approves the construction of urban facilities that are not permissible in light of current land use zoning, provided that the facilities fulfill certain requirements that ensure their performances. But, now, how can the "fulfillment of certain requirements" be objectively judged and evaluated?

Past studies discussed compact cities in terms of locational accessibility to facilities and a cost–benefit analysis of infrastructure maintenance. When the development of compact cities and the guidance of various urban functions within residential areas are to be conducted in a flexible and performance-based manner, the perspective of local residents becomes important, namely the consideration of residents' perceptions and attitudes with regard to the integration of city functions and the mixing of different land uses (Policy Research Institute for Land, Infrastructure, Transport and Tourism 2010).

Generally speaking, residents want to protect their residential environments but also seek for the improvement of convenience of life. To what extent do residents accept the existence of different services in the vicinity; or how do they evaluate various facilities and psychologically trade-off the protection of residential environments and the improvement of convenience? When undesirable facilities are to be developed nearby in their residential environments, do residents approve the development if the degree of influence (usually negative) on the surrounding environments is properly controlled? In essence, how do residents psychologically assess and evaluate their residential environments?

With these practical and theoretical issues in mind, this article overviews the existing research on the development of compact and functionally integrated urban

environments in a shrinking society from the perspective of residents, focusing on their psychological evaluations of mixed-use development and perceptions of performance-based regulations.

18.2   Consideration of Urban Functional Integration from the Perspective of Residents

18.2.1   Evaluation of Residential Environments by Residents

First, we look at the concept of "residential satisfaction," which is a widely used term and of particular importance for an understanding of residential environments from the perspective of residents. Ishikawa and Asami (2012) examined the structure of psychological evaluation of residential environments by analyzing the relationship between residential attributes, personal values, and physical environments. A survey questionnaire was administered to 9423 residents in Tokyo and Kashiwa City, asking about their residences, residential environments, criterions for housing selection, and evaluations of their residential environments from various viewpoints, such as environmental quality or convenience.

An analysis of the residents' responses through a factor analysis and structural equation modeling yielded a model of psychological evaluation shown in Fig. 18.1, which consists of 13 factors: (1) family-type residence; (2) household members; (3) long-term residence; (4) priority given to educational environments; (5) traditional values; (6) satisfaction with residential environments; (7) satisfaction with convenience; (8) satisfaction with educational environments; (9) satisfaction with security and safety; (10) satisfaction with the public image of residential areas; (11) high-density, commercial (non-residential) districts; (12) agricultural districts; and (13) industrial districts.

The factor "traditional family-type residence" concerned residential attributes, which was defined by home ownership, residence in a detached house, a large house size, participation in community activities, knowledge of land use zoning, living with a spouse or unmarried children, and a high income.

Residential satisfaction was divided into five components, each relating to residential attributes and physical environments differently. For example, family-type residents tended to live in residential (non-commercial) and agricultural districts for a longer time, and have a higher degree of satisfaction with regard to security and safety, residential environments, and educational environments. Residents in commercial districts tended to be satisfied with convenience, whereas residents in residential districts tended to be satisfied with security and safety and residential environments.

Notably, the level of residential satisfaction was affected by individuals' personal values to a greater degree than by other factors. Residents who scored higher on traditional and altruistic values tended to have a higher degree of residential
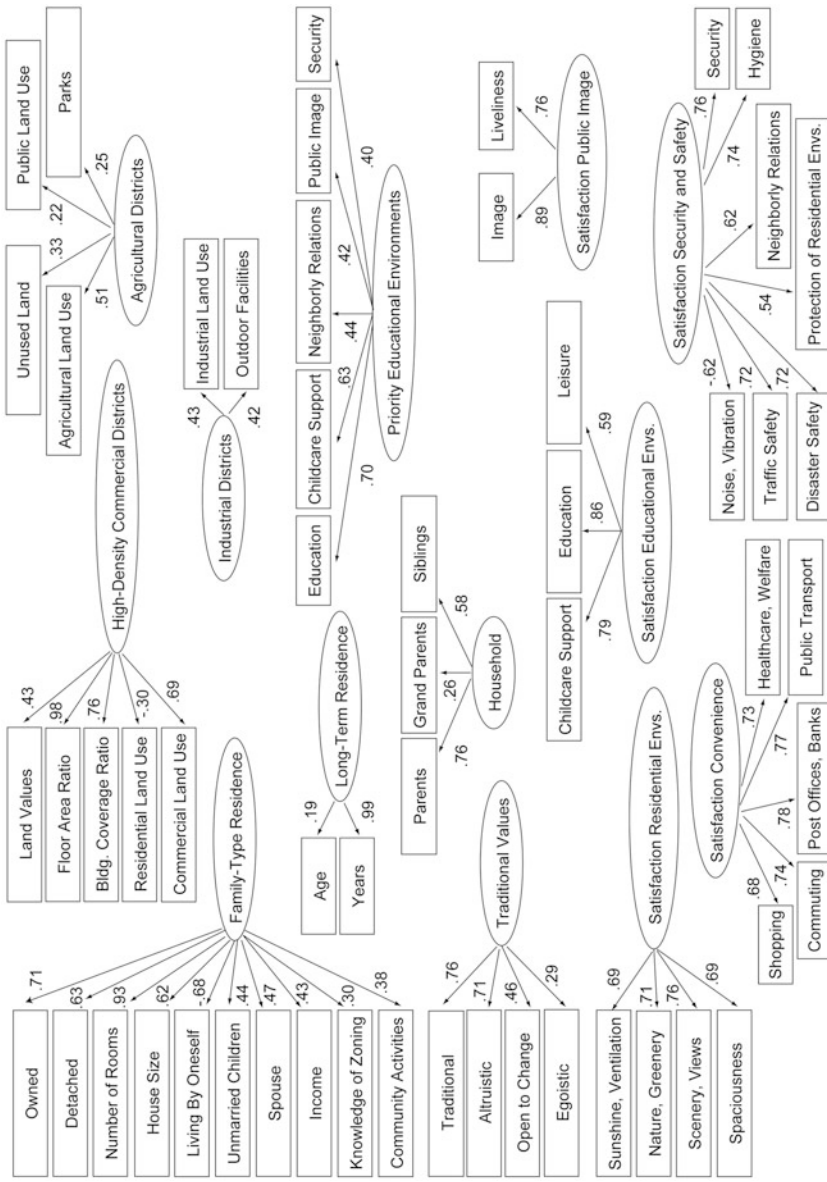
Fig. 18.1 Factor structure of residential satisfaction and psychological evaluation of residential environments (values indicate factor loadings of measured variables; paths between latent variables are omitted)

satisfaction overall and wanted to continue to live in their current residential neighborhoods.

18.2.2   Attitudes to Mixed Land Use and the Effect of Performance-Based Regulation

Next, we look at residents' perceptions and awareness of mixed land use and attitudes to the concentration of urban functions in the development of compact cities. Ishikawa and Asami (2013a) administered a questionnaire to 2993 residents nationwide and examined their psychological evaluations of various urban facilities and services in residential areas.

Respondents were given a list of 26 major urban facilities and asked to evaluate, on a 7-point scale, whether they would like each facility to be located in their residential environments (1 = *do not like it located*; 7 = *like it located*). Results in Table 18.1 show that residents wanted to have parks, shopping streets, convenience stores, and hospitals to be located nearby (a mean score of 5.5 on a 7-point scale), but did not want short-term rental apartments, garbage disposal facilities, warehouses, and sports facilities to be located nearby (a mean score of 2.5).

Respondents also described why they did not want specific facilities to be located nearby. Their answers showed some systematic patterns; in particular, many residents were concerned about noise and passers-by caused by the existence of facilities that they thought undesirable. Noise and passers-by were also given by some residents as reasons why they did not like facilities such as parks, shopping streets, and convenience stores to be located nearby, although these facilities were generally regarded as favorable.

A possible effect of improving the performances of facilities by regulating the quality that residents identified as reasons why they disliked those facilities (whose mean evaluation scores were below 2 on a 7-point scale) was further examined by

Table 18.1 Evaluation scores of various facilities (on a 7-point scale), reasons why the facilities were undesirable (percentage of responses for noise and passers-by), and the effect of improving their performances

Facility	Evaluation	Noise	Passer-by	Effect size
Park	5.8	48	38	3.2
Shopping street	5.5	44	48	3.3
Convenience store	5.5	39	53	2.2
Short-term apt.	2.8	12	68	1.7
Garbage disposal	2.4	41	5	1.4
Hospital	5.5	24	41	3.1
Parking lot	4.6	60	31	1.5
Warehouse	2.4	58	23	1.3
Amusement	2.9	49	59	1.5

asking, "If the reason that you do not want the facility to be located nearby is controlled (e.g., the level of noise is reduced), would you want it to be located nearby?" The effect size of improvement was examined in terms of the difference in evaluation scores before and after the supposed improvement, divided by a former standard deviation (Table 18.1). Results revealed a significant increase in evaluation for parks, shopping streets, and hospitals (a mean effect size of 3.2), but not for garbage disposal facilities, parking lots, warehouses, and sports facilities (a mean effect size of 1.5).

These findings point to the possibility that facilities in the former group may be accepted for inclusion in residential environments with appropriate regulation of annoying factors. For facilities in the latter group, however, controlling of their performances through regulation does not contribute much to the improvement of residents' psychological evaluations.

18.2.3 Evaluation of Life Convenience and Tolerance to Land Use Mix

Finally, we look, in relation to the preceding findings about residential satisfaction and attitudes to mixed land use, at the connection between the degrees of satisfaction with convenience and tolerance to land use mix. Ishikawa and Asami (2013b) examined tolerance to, or psychological acceptance of, mixed land use among 1259 residents in Tokyo and Kashiwa City, through a questionnaire survey asking about the distance to travel to various facilities and the level of satisfaction with these travel behaviors.

An analysis of their responses through structural equation modeling yielded a path model shown in Fig. 18.2. It illustrates the relationship of the distance to a facility and satisfaction with travel (path 1) and the relationship of satisfaction with travel, priority given to residential environments and life convenience, traditional values, and residence in commercial with the degree of tolerance to the mixture of non-residential facilities in residential areas (paths 2–6).
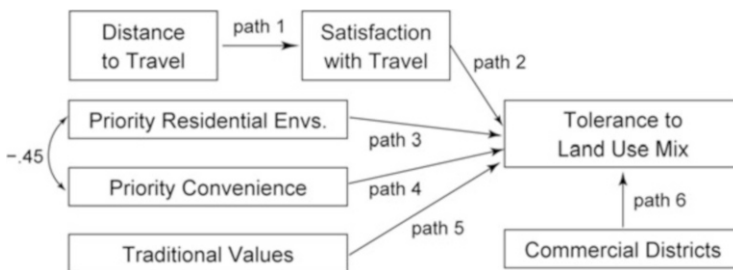
Fig. 18.2 Structural equation model of satisfaction with travel and tolerance to land use mix

Table 18.2 Path coefficients for the structural equation model of satisfaction with travel and tolerance to land use mix (ns: nonsignificant)

Activity	Facility	Path 1	Path 2	Path 3	Path 4	Path 5	Path 6
Hospital	Hospital	−0.29	0.12	ns	ns	0.20	ns
Shopping	Shopping street	−0.18	ns	ns	ns	0.19	0.10
	Shopping mall	−0.18	ns	ns	0.11	ns	ns
	Convenience store	−0.18	0.12	ns	0.10	ns	0.09
Walking	Park	−0.14	ns	−0.09	ns	0.23	ns

Among the combinations of the types of activities and facilities examined in the Ishikawa and Asami (2013b) study, this article focuses on (a) visits to hospital, (b) shopping for daily necessities in a shopping street, (c) shopping for daily necessities in a large shopping mall, (d) shopping for daily necessities at a convenience store, and (e) taking a walk in the park (Table 18.2).

The coefficients observed for path 1 were negative, showing that the level of satisfaction with travel tended to be higher as the distance to travel became shorter. However, satisfaction with travel was not related to the degree of tolerance to land use mix (path 2 coefficients were small or nonsignificant). That is, although the level of satisfaction decreased with increased distance to travel to visit associated facilities, people who were dissatisfied with travel did not want the facilities to be located nearby in their residential areas. In other words, dissatisfaction with convenience in terms of traveling does not necessarily lead to the acceptance of non-residential facilities by local residents in the form of mixed land use. It was also found that personal values of individual respondents (traditional values) tended to influence their tolerance to mixed land use (path 5), pointing to the importance of considering the characteristics or attributes of residents.

18.3   Toward the Guidance of Urban Facilities and Functions Adapted to the Characteristics of Regions and Residents

This article discussed how urban planning can tackle problems associated with city shrinkage through the development of compact cities, and particularly how an appropriate level of integration of different urban functions can be achieved with the attributes of local residents and their perceptions of, and psychological tolerance to, land use mix taken into consideration.

First, the concept of residential satisfaction was decomposed into five categories (satisfaction with residential environments, convenience, educational environments, security and safety, and a public image), and the relationship between each type of satisfaction and residential and physical environmental attributes was examined. In the evaluation of residential environments by residents, personal values were shown to have significant effects.

Next, an analysis of local residents' perceptions of land use mix showed that there are urban facilities and functions that many residents want to be located in the vicinity (parks, shopping streets, convenience stores, and hospitals) and facilities that they do not want to be located (short-term rental apartments, garbage disposal facilities, warehouses, and sports facilities). There was also a systematic pattern in the reasons that residents did not want specific facilities to be located nearby, annoyance due to noise and passers-by being a major reason. Furthermore, controlling and eliminating the reasons for the annoyance was found to improve the tolerance to the existence of parks, shopping streets, and hospitals. These results indicate the possibility of promoting the mixture of these land uses in residential areas with performance-based regulations, and suggest the significance of taking residents' perceptions and attitudes into account in the practice of flexible urban planning.

A further analysis of the relationship between satisfaction with travel and tolerance to land use mix showed that although residents tend to be dissatisfied if the distance to travel to engage in activities at specific facilities is longer, they do not necessarily want those facilities to be located nearby (i.e., oppose to mixed land use in residential areas). Stated differently, promoting compact urban development and integration of different urban functions solely from the viewpoint of improving life convenience may cause psychological resistance from local residents.

What are the implications of these results for the practice of guiding urban functions in the planning of compact urban environments? Importantly, it should be stressed that there is a close relationship between psychological evaluation of residential environments and physical environmental attributes. When approaches to urban planning aim to deal with problems due to city shrinkage flexibly, they are required to adapt to the characteristics of regions and residents (i.e., locality and people), as opposed to traditional planning approaches that are based on predetermined and omnibus regulations.

In particular, this article demonstrates the significance of residents' perceptions and attitudes as a main target in the consideration of this sort of flexibility in urban planning for a shrinking society. To promote the guidance and concentration of functions in urban areas appropriately and effectively with a view to developing compact cities with multi-polar networks, as advocated by the Location Normalization Plan, it will be more important than ever to conceive planning that emphasizes both the region and the resident.

To achieve the goals of guiding urban facilities and functions in a manner tailored to regions and maintaining residential environments with due consideration of local residents is in general not straightforward. But considering the diversity of urban functions, residential preferences, and lifestyles in our present and future society, new approaches in planning that assume flexibility with respect to local situations and residents are essential. To that end, studies of residential environments from the perspective of residents, as discussed in this article, will become still more important.

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Chapter 19
Compact City Corresponding to the Advanced Transport Systems

Akinori Morimoto

Abstract Location normalization plans that are currently being established across the country encourage a loose approach to land utilization guidance by establishing the areas where urban function guidance and residential guidance apply. We will consider some hints as to how to proceed with urban downsizing by looking back at how urban areas expanded during the period of population growth. It is important that the characteristics and roles of each transport system are reorganized and that they are skillfully incorporated into cities. In particular, the formation of transfer points between main line transport systems and branch line transport systems is a key to the formation of compact cities.

Keywords Compact city · Advanced transport systems · Land use and transport

19.1 Introduction

Currently, Japan is experiencing significant depopulation. According to 2017 estimates from the National Institute of Population and Social Security Research, the population in 2050 will be 101.92 million, which is equivalent to that of 1970, while the population in 2100 will reduce to 59.72 million people, which is equivalent to that of 1925 (see Fig. 19.1).

The transition of a continuously depopulating and aging society increases the substantive and relative burden on people of working age, and local governments will inevitably undergo difficulties in financial management due to reduced tax yields and increased expenditure.

One of the reasons for the implementation of the compact city policy in Japan is the transition to a sustainable urban structure to address the reduced population. Housing estates built by clearing away forests and agricultural land and urban areas

A. Morimoto (✉)
Waseda University, Tokyo, Japan
e-mail: akinori@waseda.jp

(population *10,000)
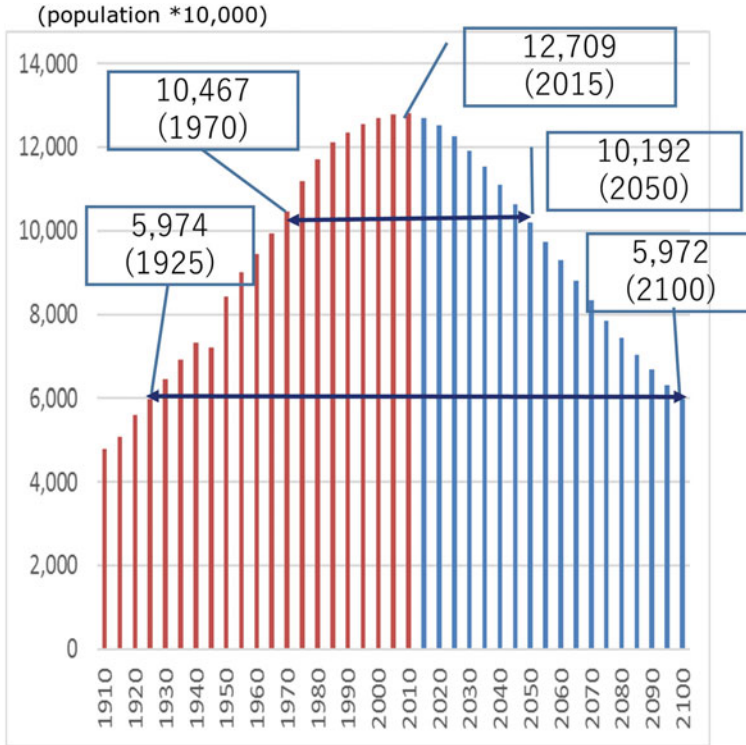
Fig. 19.1 Japanese population transition and estimates

that expanded through suburban sprawl during the period of population growth have become a major burden during this period of depopulation. While there are the same operation and management costs for infrastructure such as water and sewer services, bridges, and roads, the cost per person will continue to increase because the number of people bearing the financial responsibility for such infrastructure is decreasing. With increasing costs for medical care and welfare costs to support a rapidly aging society, securing the operation and maintenance expenses for urban areas is a problematic issue for all local governments. Downsizing cities in an intelligent manner to address the reduced population has become a matter of urgency for Japan.

In that case, how can cities that have expanded be made more compact? Location normalization plans that are currently being established across the country encourage a loose approach to land utilization guidance by establishing the areas where urban function guidance and residential guidance apply. While some results can be expected from this, it is not clear whether it will be enough. In this paper, we will consider some hints as to how to proceed with urban downsizing by looking back at how urban areas expanded during the period of population growth.

19.2 Relation Between Land Use and Transport

Historically, the development of transportation facilities greatly contributed to the expansion of urban areas. At a time when people predominantly moved about on foot, urban areas were concentrated to an area of within about 30 min walk from the center. In the Meiji era, when railroads were constructed, the center of the city gradually moved to the areas around stations, and metropolises have formed by connecting several cities cooperatively through the development of railway network. In the 1960s, as automobile ownership rapidly increased, the outskirts of urban areas further expanded, and various facilities were relocated in the suburbs, including public facilities, such as municipal offices and hospitals.

Land use changes as transport changes, too, and both are often compared to "chicken-and-egg relation." In general, the demand for transport is derived demand of land use. If the primary demand for land use changes, demand for transport also changes accordingly. This relationship is shown in Fig. 19.2. Urban activities are performed and transportation activities are derived accordingly. Transportation facilities are improved in order to alleviate traffic jam, which is caused by increases in transportation activities. However, changing the supply of transportation facilities has an effect on the location of urban facilities.

Urban activities were increasing during periods of population increase, and transportation activities increased accordingly. As the supply did not keep up with rapidly increasing demand, various urban problems arose, such as housing shortages, traffic congestion, and environmental issues. The objective of city planning was the healthy development of cities and the promotion of public welfare, and it can be interpreted that the city planning concentrated on how best to balance supply with demand.

The process of keeping a balance between supply and demand is different in the fields of land use and transport. Land use is often formed primarily by the market economy. For example, a housing shortage due to an increasing population can be mitigated through the real estate market by the construction of private apartments, and balance can be restored in a relatively short time. On the other hand, when providing road transportation facilities in response to an increased demand for transport, time is often needed because it is planned by public agencies, and it is necessary to secure funds and gain the approval of residents. One example of this is the issue of urban roads authorized in city plan which have not yet moved into action

Fig. 19.2 Relation between land use and transportation
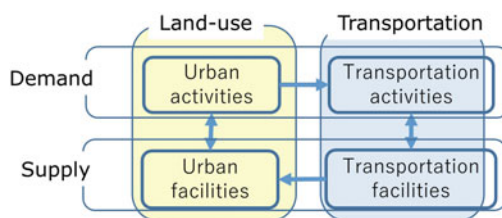
Table 19.1 Conflicting orientations of land use and transportation (Gakenheimer 1993)

	Land use planning	Transportation planning
1. Scales of concern	Small	Network
2. Objectives of planning	Complex	Simple
3. Horizons of confident projection	Short	Longer
4. Techniques of analysis	Ad hoc	Standardized
5. Levels of government involved	Local	Regional and national
6. Prospects for implementation	Low	High
7. Units of implementation	Small	Large
8. Levels of budget	Small	Large

over a long period of time. Whereas it is possible to respond to land use in a relatively short time, the provision of transport facilities must be dealt with in the long term.

Although the mutual relationship between land use and transport should preferably be taken into consideration when making plans, it is not easy to do this because they each have characteristics which differ in various ways. As shown in Table 19.1, Gakenheimer (1993) analyzes difference between the two by summarizing factors which cause disassociation between land use and transportation planning.

19.3   Land Use from the Viewpoint of Transport

Transport demand always comes first during periods of population growth, which means there is a delay in the provision of transport facilities. In contrast to this, what happens during periods of depopulation? If there is a decrease in the population which is the source of the demand for transportation, this may resolve the unbalance in the supply of transportation facilities, and it may be necessary to curtail supply plans in some areas—this includes a review of long-term unbuilt roads in city planning, as mentioned above.

As for the ideal provision of transport facilities in the future, in a period of depopulation, it is important to make skillful use of the roads that have taken time and money to construct. When the population was increasing, land use was rapidly promoted, and thus unavoidably the market took priority, but in this period of depopulation, it is important to adopt a viewpoint that emphasizes transportation infrastructure.

Rather than providing transportation facilities in response to land use based on free economic activities, it is essential that land use is guided in a favorable direction wherein the transportation facilities that have already been amassed are skillfully used.

How can transport guide land use? The answer lies in changes to transport systems. Cities achieved major growth due to changes to the main transport systems

of walking, railroads, and automobiles. In other words, the advancement of transport systems has changed land use.

19.4   Advanced Public Transport and City Planning

What form will the next generation of public transport that will be used in the future take? The answer to that is not clear at present, but there are some transport systems that are attracting global attention in this regard.

Light rail transit (LRT) must be mentioned at the top of the list. Whereas railroads have been used to transport large numbers of passengers primarily between cities until now, attention is again being given to trams as a form of intra-city transport. The first LRT was introduced in Edmonton, Canada, in 1978, after which more cities began using it, so that 167 cities have newly introduced LRT as of the end of September 2016 (Hattori 2016). The difference from conventional trams is that LRT is a form of transport that has been coordinated for every aspect of travel, including low-floor carriages with excellent barrier-free accessibility, new carriages and tracks that produce little noise or vibration, a design that is integrated with tram stops, and electronic payment systems.

Figure 19.3 shows the LRT in Strasbourg that began operating in 1994. Rather than simply being another mode of transport, it is part of the attraction of the city, as it helps to increase the flow of pedestrians in the city and increase sales at commercial centers along the tracks.

Although the LRT is rapidly developing in locations around the world, the only example from Japan is that of the Toyama Light Rail in the city of Toyama. It began

Fig. 19.3   Eurotram in Strasbourg (Germany)

operating as an improved service for the existing Toyama Port Line in 2006, and it has made a major contribution to increased usage and the revitalization of the city center. Sustainable city planning in Toyama using the LRT is highly regarded in Japan and overseas, and it has won many awards. Although Japan's first LRT project is incredibly well regarded, no other city has introduced it so far.

Why has LRT not yet been more widely implemented, when the need for LRT is recognized and many cities have considered introducing it? The challenges for introducing LRT in Japan at present can be summarized in terms of financial issues and issues with building a consensus. A detailed description is not possible here, but the financial issues are triggered by Japan's public transportation policy which is based on a self-supporting accounting system. There are also many other issues, such as coordination with other transport businesses, consensus building with businesses and residents near railway tracks, and political activities related to the above.

19.5 Utsunomiya LRT Introduction and Policy to Make the City More Compact

Currently, Utsunomiya (population of 510,000), the prefectural capital of Tochigi, is receiving attention as the second candidate city for LRT introduction. Consideration on this matter goes back to 1993 and initially stemmed from an attempt to solve the chronic traffic congestion on the left bank of Kinugawa River on the east side of Utsunomiya Station by introducing a new transport system. By the twenty-first century, the regeneration of central urban areas became a major challenge, including revisions to what are referred to as the "Three Urban Development Laws." Consideration regarding the LRT extended approximately 3 km to the west side of Utsunomiya Station so that it would reach the city center. However, this resulted in conflict with bus operators that were providing services to the city center. Later, as the major challenges shifted to dealing with environmental issues and a depopulating society, the target for town planning underwent a major change from solution-based to target creation-based planning. In the Fifth Utsunomiya City Comprehensive Plan from 2008, a "network-based compact city" was positioned as the basic policy for urban space formation. In 2009, in the second Utsunomiya City Master Plan, LRT was positioned as the core of east-west main public transport system. In the Utsunomiya City transport strategy from the same year, a framework was defined for a comprehensive transport system that included the establishment of a plan for diverse transport systems such as automobiles and buses in coordination with LRT. To summarize the details so far, the story can be split into three phases based on the different primary planned targets (see Fig. 19.4).

While a legal plan has been established and a framework toward implementation has been demonstrated, each of the challenges stated above must be conquered in order to promote the actual introduction of LRT.
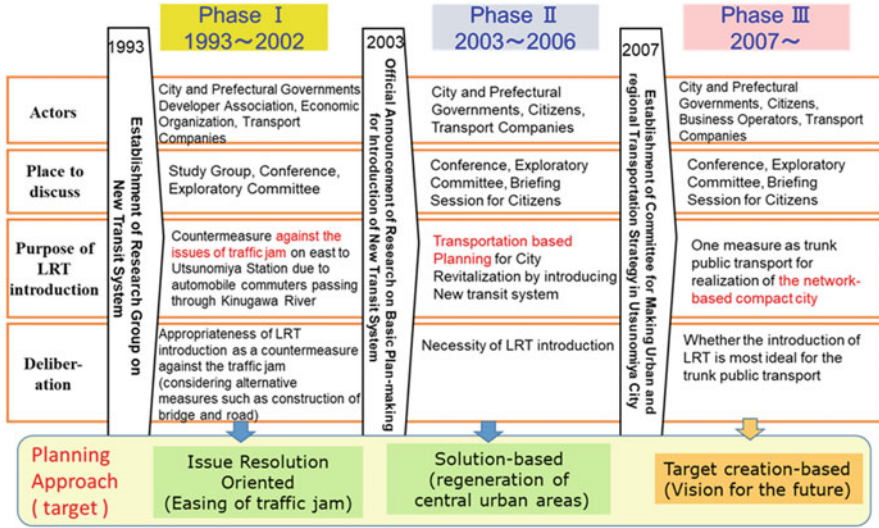
Fig. 19.4 Utsunomiya LRT route under consideration
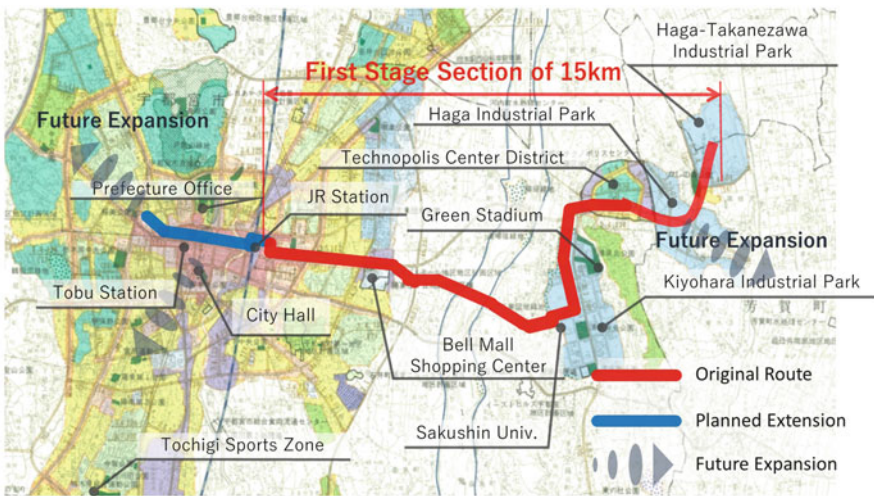
Fig. 19.5 LRT service route in Utsunomiya

The turning point in building a consensus began with PR activities in 2011 when an open consultation was held to explain LRT to citizens and in 2012 when the current mayor won a third election. The mayor, who understood that a common consensus had been reached regarding the introduction of LRT, began taking initiatives from 2013 to increase the project budget and to make changes to government staff. Because of the need to carefully build a consensus for the extension (approx. 3 km) to the city center on the west side of the station, which had been

heavily opposed, a policy was worked out for the initial supply of the first plan along the east side of the station (approx. 12 km). Later, when Haga, a nearby town, requested an extension to the industrial park (approx. 3 km), the Haga/Utsunomiya Main Public Transport Investigative Commission was established in November 2013, and full-scale studies began in connection to business profitability (see Fig. 19.5). After that, expectations increased regarding the introduction of LRT to the city center, including the issuance of a "Proposal regarding LRT business promotion and initial extension to the central town area" from the Utsunomiya City Development Promotion Organization in 2014, comprising mainly business-people from commerce and industry.

Meanwhile, regarding the financial issues, a large-scale study was made into transport volumes in 2014, which concluded that sufficient profitability could be anticipated, and the public-private Utsunomiya Light Rail Company Limited was established in November 2015. In May 2016, a city planning decision was made regarding the supply route, which was approved as an Advanced Railroad Transport Project by the Ministry of Land, Infrastructure, Transport and Tourism in September 2016 after undergoing a public hearing at the transportation commission. The current mayor won a fourth election in the November 2016 elections, and, while making efforts toward a PR campaign aimed at citizens, the aim is to start operation in March 2022 after a construction schedule of about 4 years.

Also, in order for Utsunomiya to become a network-based compact city, a location normalization plan was established in March 2017.

Of the ten urban function guidance areas, eight are designated as areas that include railroad stations and LRT stops (see Fig. 19.6). In particular, LRT is a major east-west public transport system that connects the city center, transit centers, and the suburbs, which, when completed, will be the first case in Japan of an LRT with entirely new lines.

19.6 Automated Driving and Compact Cities

In terms of advanced transport systems that affect land use, attention must also be given to automated driving. This is a visionary mode of transport which is able to move to the destination without a driver, and it is an extremely effective form of technology for both mitigating congestion and ensuring safe transport. However, it may also be the case that a second wave of motorization brought about by automated driving may also promote further suburbanization of urban areas. For local governments that are promoting policies to make cities more compact, automated driving technology may be a favorable or opposing wind, depending on how it is used. According to the 2014 definition from the Society of Automobile Engineers (SAE) in the United States, there are the following categories of automated driving (see Table 19.2) (SAE 2014).
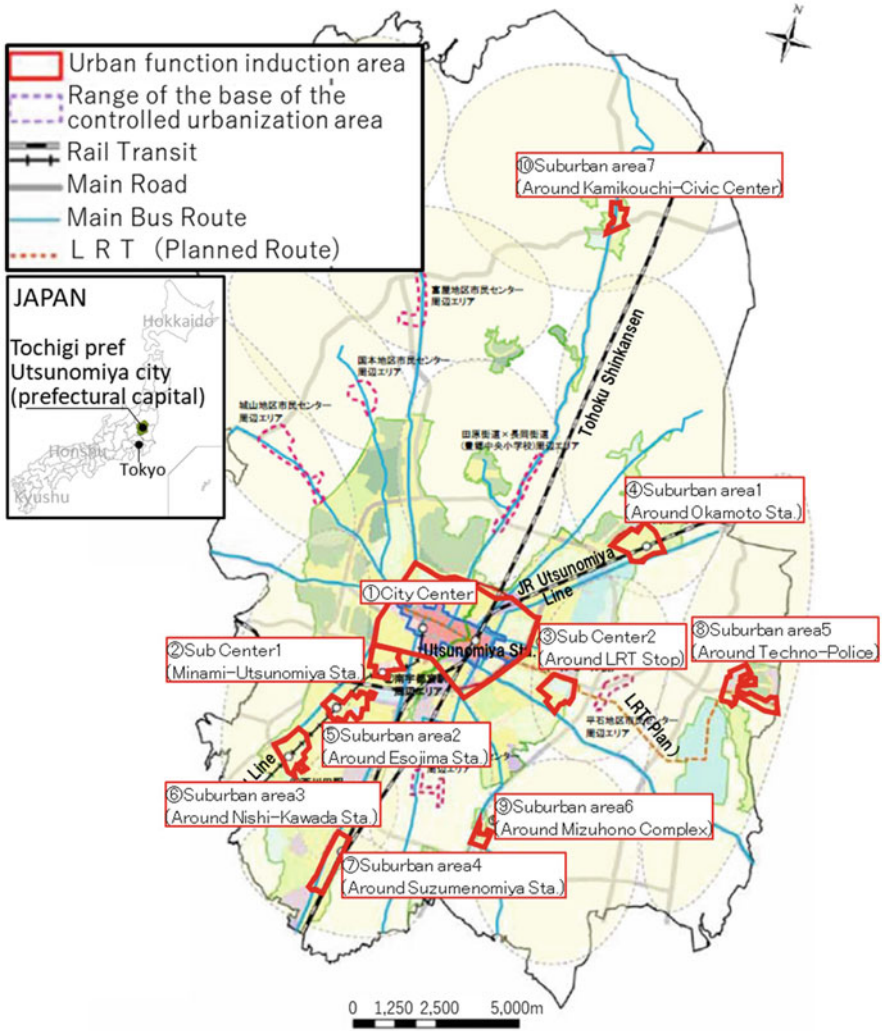
Fig. 19.6 Utsunomiya City location normalization plan

Although the person driving is the operator until Level 2, the system is driving from Level 3 onward. Furthermore, from Level 4, a driver is not required, and the vehicle can be operated even after drinking alcohol or by older people who do not have licenses.

From the viewpoint of city planning, attention should be given to the spread of Level 4 automated driving technology. This should preferably be introduced in limited strategic areas in order to increase social benefits. In city suburbs and rural towns, in particular, public transport is in decline due to depopulation and an aging

Table 19.2 Definitions of automated driving levels (SAE J3016)

SAE level (SAE name)	SAE narrative definition
Level 0 (no automation)	The full-time performance by *the human driver*
Level 1 (driver assistance)	The *driving made-specific* execution by a driver assistance system of either steering or acceleration/deceleration
Level 2 (partial automation)	The *driving made-specific* execution of one or more driver assistance systems of both steering and acceleration/deceleration.
Level 3 (conditional automation)	The *driving made*-specific performance by an automated *driving system* of all aspects of the *dynamic driving task*
Level 4 (high automation)	The *driving made*-specific performance by an *automated driving system* of all aspects of the *dynamic driving task*
Level 5 (full automation)	The full-time performance by an *automated driving system* of all aspects of the *dynamic driving task*
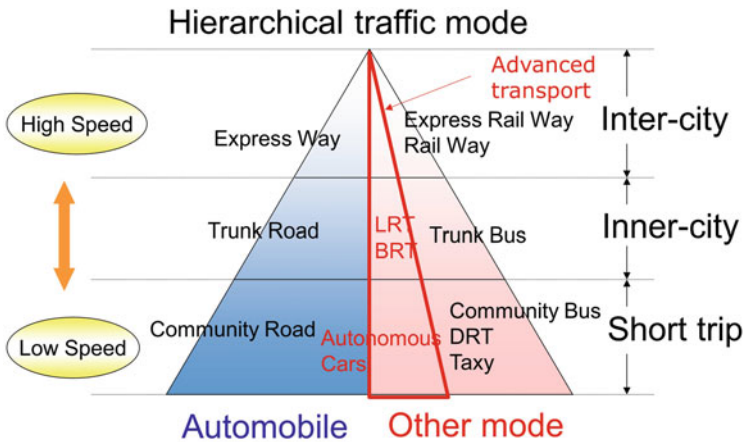
Fig. 19.7 Urban traffic strategy for next step

society, and securing mobility is a major challenge. A rapidly aging society could be supported by introducing automated driving technology in regions where public transport is not convenient.

Figure 19.7 shows the preferable transport systems for the near future. Trunk line systems of network are provided using LRT and other advanced public transport, while areas spreading out from transportation hubs are covered by branch line public transport systems adopting automated driving technology.

The key to forming network-based compact cities is the construction of public transport systems with different roles played by main lines and branch lines. Figure 19.8 shows an illustration of a compact city and transport spaces. Transportation hubs are connected by public transport systems on the main line, which
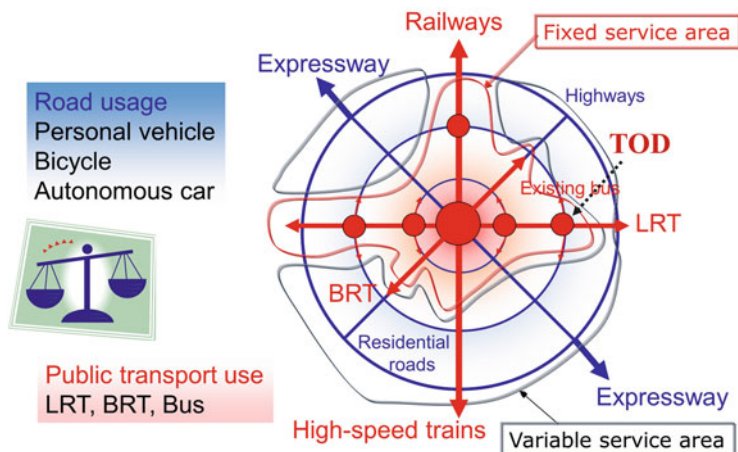
Fig. 19.8 Transport systems that encourage urban consolidation

ensures regularity and speed. It is also necessary to make efforts to increase the attractiveness of city spaces by means of vehicle design and so on that are integrated with city development. Meanwhile, branch lines will utilize transport systems for flexible route selection, including walking, bicycles, personal mobility, and automated operation vehicles. Areas around stations and tram stops will prioritize walking and cycling with the aim of creating spaces that make walking enjoyable, and residential roads will become safe transport areas with upper speed limits of 30 km/h. Urban areas are shrinking due to depopulation in areas where services are provided by branch line systems, and so flexible transport systems would be a suitable response to this.

19.7   Conclusion

Until now, transport systems have been provided as a whole while maintaining a certain balance between private transport, such as automobiles, and public transport, such as railroads and buses. However, as public transport has fallen into decline with the rise of automobiles, that balance has largely been lost, and cities have become overly dependent on private transport. In order to form compact urban areas in line with a depopulating society, that balance must be regained.

Even if current automobiles are converted to automatic operation (Level 5) in the future, there will be a period in the process of introduction in which manual operation is mixed with automatic operation. During that period, it is important that the characteristics and roles of each transport system are reorganized and that they are skillfully incorporated into cities. In particular, the formation of transfer

points between main line and branch line in the transport systems is a key to the formation of compact cities.

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Chapter 20
Current Status and Issues for Urban (Regional Area) Formulation of the Location Normalization Plan: The Case of Niigata City

Yoko Ogushi

Abstract In the case that the amount of investment differs between the designated area and other area, the impact on land prices will be unavoidable. In Niigata City, the plan has just been completed. From now on, we need to pay close attention to how to make land use more appropriate by policy guidance and how it affects the land price.

20.1 Introduction

The twin prospects of a declining population and a super-elderly society that face Japan have already become a serious issue in regional cities (Ministry of Internal Affairs and Communications 2005), and a faster response is required. In Niigata City, despite a population increase of more than 600 dues to social movements, there has been a more-than-2000 decline in population because of natural movements, which have caused a sharp decline in the net population (FY2013 Niigata Prefecture Population Movement Survey). The population is anticipated to continue declining with natural movement seen as the primary cause. Hence, it is actually quite complicated to consider whether there has been a large decline in the price of land in Niigata City. Observing the changes in the price of land from the published land prices released in March 2017, one can tell that the price of land within the city fell in terms of the average for all land uses but that the rate of decline was 0.4%, a contraction of 0.4 points from the previous year. Even when considered by site,

Y. Ogushi (✉)
Niigata University, Niigata, Japan
e-mail: ogushi@sugiyama-u.ac.jp

the number of locations in which prices rose increased from 15 to 32, while the year-on-year price change was flat in 36 locations. The price of land only rose in the city center, and land prices rose in areas with easy access to the city center. However, even in Chuo-ku (the central ward), the decline in price was exacerbated in areas that were inconvenient for access to the center.

In the future, it is only natural that there will emerge a difference in the state of readiness between the urban function and residential environments, depending on the guidance zone. (Ministry of Land, Infrastructure and Transport 2014) There will be concentrated development in the businesses of promoting urban renewal and maintenance planning in the urban guidance of the urban facilities/functions zone and residential guidance zones in accordance with the Location Normalization Plan enacted in March 2017. Consequently, this will also likely have an impact on the demand for land and the price of land. Nevertheless, it is not clear as to how much discussion there was with regard to the impact that the plan would have on the trend for change in the price of land when the plan was being formulated.

The author had a valuable opportunity as a committee member on the "Advisory Board to Create a Sustainable City," which formulated this plan. The Advisory Board discussed the matter following an overview of the current state of Niigata City, referring to issues that had aroused the interest of committee members, and talked about the contributions and limits of this plan.

20.2   Niigata City

20.2.1   Current State of Land Use

Through consolidation during the Heisei era (1989–2019), Niigata City was reorganized as 14 municipalities and 1 city in April 2007, home to a population in excess of 800,000 and spread over an expanded area of 726 km^2 (according to the residents' basic ledger population on the Niigata City website). While being a legally designated city, the area under cultivation is 286 million hectares by municipality, which is the largest in the nation. This is substantially larger than Daisen City in Akita Prefecture, which has the nation's second largest area under cultivation, covering 185 million hectares (according to the FY2012 Area of Cultivated Land Survey). Total land use figures point to urban use accounting for approximately 30% and natural land use accounting for approximately 70% (Niigata City, page 13), with approximately 560 hectares of underutilized land within the inner-city zone (Niigata City, page 20). In contrast to the areas that are not being used in the inner-city zone, there are large stores and roadside service facilities concentrated along major roads and in suburban areas.

20.2.2 Specific Urban Planning

The "Basic Plan for Urban Planning in Niigata City (Niigata City Urban Planning Master Plan)" was released in Niigata City in July 2007 as though anticipating the idea of the "Ministry of Land, Infrastructure, Transport and Tourism's Grand Design of National Spatial Development Towards 2050," which was released in July 2014. This master plan was aimed at an ideal city, one that was defined as "multiple centers surrounded by fields—creating a compact city with a Niigata feel." The composition of multiple centers is the eight wards derived from the transition to a government-designated city (The transition of Niigata City to a government-designated city occurred on April 1, 2007.). While Niigata City also has a wide area of cultivated land and is reputed to be one of the country's largest grain-producing regions, it comprises a city center and eight wards, each of which is connected by a public transport network and key roads in a skeletal structure that is ideal for a city (see Fig. 20.1).

20.2.3 Transportation Methods of Niigata City Residents

If one asks whether public transportation is already complete, the answer is that the current state is vague. Niigata City rearranged its public transportation system to link the central areas of each district, as in the case of the location of ward offices in each district such that each ward has places that are necessary for everyday life (Niigata City 2017). Nevertheless, there were large biases in the manner in which people moved between wards (Fig. 20.2), with 70% of the residents of Niigata City using cars as the method of transportation, which is overwhelmingly high when compared with other transportation modes. (As above, page 34).

Visualizing the volume of transportation among wards by transportation mode highlights the obviously high degree of dependence on cars (Fig. 20.3). The number of bus users has fallen to about one-third during the past 20 years, from 69 million in
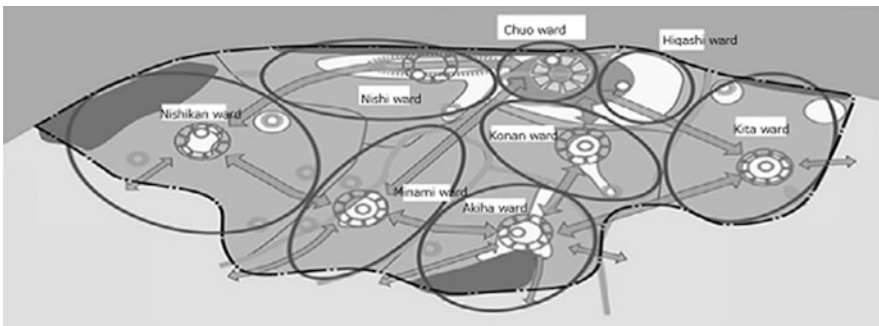
Fig. 20.1 Concept diagram for Niigata City's urban structure: 8 core wards
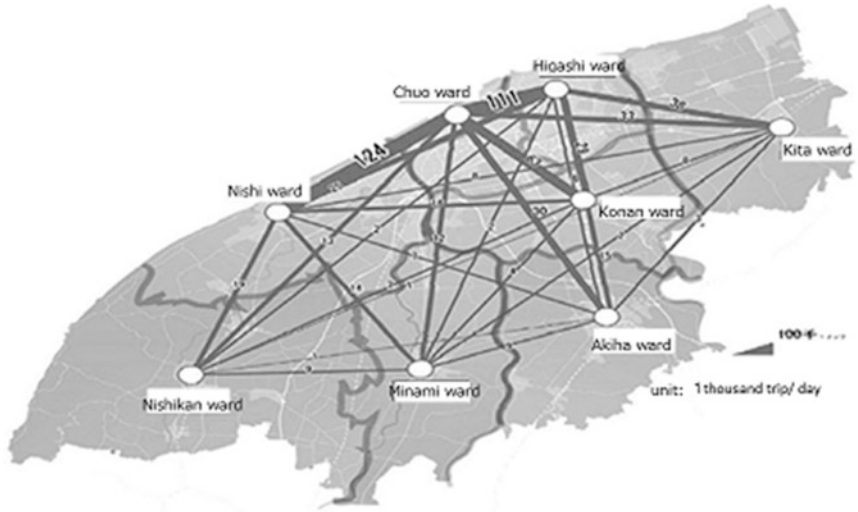
Fig. 20.2 Movement of people between eight core wards. Materials: FY2011 Survey of Urban Transportation Features within Niigata City

Fig. 20.3 Movement of people between wards (movement between zones by transportation mode). Materials: FY2011 Survey of Urban Transportation Features within Niigata City

1990 to 24 million in 2010. As the number of routes has also fallen with the decline in the number of users, the convenience factor has only declined.

Hence, Niigata City introduced Bus Rapid Transit (BRT) in 2015 with buses running along the main roads as a public–private partnership in an effort to increase access by allocating spare drivers and buses to areas that were inconvenient for transportation.

This is a big step toward dealing with the anticipated increase in demand for public transportation, given the aging population.

20.3   Discussion at the Advisory Board to Create a Sustainable City

20.3.1   Request for Thorough Explanation on Guidance Zones

Participants also seriously understood the significance of setting guidance zones to realize appropriate locations. The city explained on numerous occasions: "Appropriate land use will be realized gradually and not through coercion."

This is because there are areas that are not included in residential guidance zones even in the existing inner city, and many people have voiced their concerns. In particular, with regard to the "town area," which is the center of each ward, the plan is to set up such zones as necessary, with one eye on future trends; thus, some ambiguity has been left in. The interest of the board members was also drawn toward the many requests for thorough explanations on the plans themselves as opposed to discussions on detailed settings for an area and the impact. Consequently, the Advisory Board increased the number of meetings it held from the original 3 to 5. There were thorough explanations and discussions, and the Advisory Board put forth many constructive opinions. Nevertheless, although there were many opinions concerning the improvements in efficiency through the implementation of the plan, there was virtually no discussion regarding how concentrated investment in an identified area would impact land price.

20.3.2   Obviously a Demand for Greater Improvement in Public Transport

One requirement for compact + network is obviously public transportation. We heard many people advocating the need for diverse public transportation modes because of the large size of the city, the need to access public facilities, everyday shopping in each location, and the concentration of medical facilities in the central area. The population will decline unless there is comprehensive public transportation in this aging society; hence, land prices will fall further, and relocating to the central area will also become inconvenient. The head of the Echizenhama Neighborhood Association also proposed to the Advisory Board members that the number of migrants be increased to create an independent area and acknowledged that the migration of middle-aged and elderly people was obviously one factor in determining enhanced public transportation.

20.3.3 "History" of Blockages Before the Merger

As noted above, Niigata City merged 14 municipalities to create the designated city. Ten years down the line, a growing sense of unity as a city is emerging. However, in firming up the zone to become an area for concentration, there are inevitably policy discussions that assume bias in the allocation of funds, with a tendency for strong opinions to be asserted that "independence needs to be considered because the circumstances differ for each ward." Therefore, it has been virtually impossible to discuss a strategic increase in the price of land in identified areas that would lead to overall optimization of land use.

20.4 Conclusion

The Location Normalization Plan in Moroyama, Saitama Prefecture, included a target of increasing the published land prices by at least 10% in 20 years. This town also forecast that the population would decline by approximately 18% over the same period (Motoyama Town 2017); however, Moroyama had the strategy of maintaining population density and convenience by guiding residents to live in residential zones, with the promotion of public investment in the guidance zones leading to an increase in the price of land (Moroyama Town 2017).

There is no mention of aspects such as published land prices in Niigata City's plan, and if there were a mistake in the amount of investment in the designated zone and areas outside that zone, the impact on the price of land would no doubt be unaffected. The Advisory Board ended up focusing discussion on improving the current status, and it was unfortunate that advanced discussion with land price awareness was not possible. Still, it is worth noting that the Location Normalization Plan is merely a plan. In the future, how to specifically aim for the appropriate use of land through policy guidance and the impact that this would have on the price of land should be the focus.

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Chapter 21
The Overview and Legal Issues Regarding Real Estate Tech

Haruo Narimoto

Abstract In this paper, I will introduce the types of real estate tech services already provided in Japan and give concrete examples, as well as explain the real estate crowdfunding, which is attracting particular attention, including laws and regulations. I will also discuss the legal issues in the use of data and personal information that are expected to arise in real estate tech services in the future.

Keywords Real Estate Tech · Prop Tech · Crowdfunding · ICT · AI · Real estate information

21.1 Introduction

As with FinTech, there are already many new services and companies in existence in the United States that are involved in Real Estate Tech, while various types of Real Estate Tech services and companies have also emerged in Japan, albeit belatedly. Nevertheless, as also with the case of FinTech, business models that are successful in the United States are not necessarily also appropriate for Japan as they are. Business models that take account of the features of the Japanese real estate market, the applicable legal systems, the customary practices and needs, as well as the national character need to be looked into.

H. Narimoto (✉)
Attorney at Law, Tokyo, Japan
e-mail: hnarimoto@tmi.gr.jp

21.2   Types of Real Estate Tech Service in Japan

21.2.1   *Matching Platform Service for Rentals, Sales, and Development*

1. The typical types are online matching services[1] that mainly target individuals for transactions between sellers and buyers of real estate and leases between lessors and lessees. The strategies of many of these types appear to be to capture customers by offering fees that are lower than previous general levels or at no charge. There is a variety of services apart from simple sales and leases, such as matching services[2] for people commissioning various contract works and contractors, matching services[3] for current tenants who hope to vacate a so-called furnished property and prospective tenants who hope to move into a furnished property and matching services[4] for sellers and buyers of land while proposing apartment management services to prospective buyers.

2. Concept of "intermediary"
   A license is required[5] under the Real Estate Brokerage Act to conduct the business of agency services or intermediary for the buying, selling, or leasing of building lots or buildings. On this point, the definition of "intermediation" is not prescribed in the Real Estate Brokerage Act. Legal precedent defines it as "any and all actual behavior made to conclude a contract for the buying, selling, exchanging, or leasing of building lots and buildings between relevant parties upon a request of one of the parties".[6]

   With regard to what type of behavior specifically corresponds to "intermediation," there is a view that it means "a behavior that results in the conclusion of a contract, for example, the search for transaction properties, the provision of property information, the advertising for sale, investigations such as the relationship of rights, local guiding, introduction of the contracting parties, explanation about the transaction property, etc., negotiation and adjustment of transaction terms, and witnessing the execution of the contract".[7] But even if there is a single behavior among those listed above that corresponds to the examples in this point of view, this does not immediately mean that it corresponds to "intermediation."

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[1]There are trade matching services such as "Ouchi Direct" (https://realestate.yahoo.co.jp/direct) and "Kauru" (http://housmart.co.jp/). Rental matching services include "officee" (https://officee.jp/) and "nomad" (https://nomad-a.jp/).

[2]"Tsukulink" (https://tsukulink.net/).

[3]"Tenpo ichiba" (https://tenpoichiba.jp/).

[4]"Tateru" (http://www.tateru.co/).

[5]Article 2, item (ii), Article 3, paragraph (1) of the Real Estate Brokerage Act.

[6]Tokyo High Court February 14, 2007 judgment (Tokyo High Court (Criminal matters) *Hanketsu Jiho* (Law Case Reports) Vol. 58, Items 1–12, page 7).

[7]Masaharu Okamoto and Misaki Uni "*(Revised Edition) Point by point Explanation of the Real Estate Brokerage Act*" (Taisei-Shuppan Co., Ltd., 2012) page 68.

It is said that "the behavior of only providing selling and buying information in relation to residential land and building is simply an information-providing activity, and does not correspond to intermediation under Article 2, item (ii) of the Act unless there is negotiation or mediation for the conclusion of a contract between the relevant contracting parties".[8] There is a related administrative judgment that "the behavior of unqualified persons or 'Taneya' who receive an honorarium for providing information to such operators from the compensation received by such operators is not direct participation, so it does not correspond to a building lot and building business operator. If there is repeated behavior such as receiving independent fees from transactional behavior jointly conducted with an operator, such act may be recognized as being engaged as a building lot land and building business operator".[9] My personal opinion is that if the behavior is limited to simply providing or posting information (including the provision of information search function) and disseminating or exchanging information or the declaration of intent, it should not, in principle, be interpreted as corresponding to an "intermediation."

3. Shift to the use of IT for explanation of important matters

A social experiment of applying IT to the explanation of important matters in lease transactions and transaction between corporations[10] was conducted up until the end of January 2017 in accordance with the "Final Report on the Investigative Committee Concerning the Approach to the Explanation of Important Matters using IT" dated January 30, 2015, and released by the Ministry of Land, Infrastructure, Transport and Tourism.

"A Report from the Investigating Committee Concerning the Social Experiment Relating to the Explanation of Important Matters Using IT" was released by the Ministry of Land, Infrastructure, Transport and Tourism in March 2017 taking account of the results of such trial experiment. This stated that it was appropriate to transition to full-fledged operations in FY2017 after implementing preparatory measures such as clarifying the items that should be observed when implementing the explanation of important matters using IT and notification to registered real-estate brokers and concluded that the full-fledged operation of the explanation of important matters using IT pertaining to lease transactions should be started with a target date of October 2017.[11]

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[8]Masaharu Okamoto and Misaki Uni "*(Revised Edition) Point by point Explanation of the Real Estate Brokerage Act*" (Taisei-Shuppan Co., Ltd., 2012) pages 70 and 71.

[9]October 8, 1963 Construction Design No. 108, Response from the Director General of Planning, Ministry of Construction to the Director of Construction Department, Prefecture of Osaka.

[10]It is said to refer to the systems, etc. such as video conference and videophones that can engage in both video and voice simultaneously in both directions using PC, smartphone, tablets, etc.

[11]Note in regard to transactions between corporations, it was appropriate to continue the implementation of the social experiment, and that if there was no problem in taking the necessary measures and no new issues of concern emerge as a result of the verification by subsequent investing committees, there would be a transition to full-fledged operations. In addition, for purchase and sale transactions that include individuals, it was determined that there would be

However, close attention has to be paid to the fact that the above operation will enable the use of IT to fulfill the obligation of explaining important matters, but it does not enable the issuance of documents mentioning important matters by electromagnetic means. Revision of the Real Estate Brokerage Act is likely to be required to make the issuance of the document explaining important matters itself possible.

21.2.2 Real Estate Value Evaluation and Information Search Services

1. These are the services that estimate and calculate the present value and sale price of real estate based on various open data and past transaction information for each company using independent algorithms and deep learning AI.[12] Furthermore, there are also services that estimate and calculate the lease fees and future resale price when they are offered for lease and also services that provide information such as investment yields.[13]

2. Real estate appraisal business
   "Real estate appraisal" is said to refer to the determination of the economic value of real estate, which is consequently indicated as price.[14] On this point, although services that calculate the present price of real estate, for example, through AI, also seem to correspond to the service of real estate appraisal, since "real estate appraisal business" is set to mean the business of appraising real estate[15] at the request of other people regardless of whether they do it themselves or use another person, determining or displaying the economic value of real estate without compensation would be possible to be considered not corresponding to "real estate appraisal business."

3. Real estate investment advisory business
   Providing advices concerning sales and purchase of real estate as a business can be considered to correspond to a "real estate investment advisory business." However, this real estate investment advisory business is an optional registration system.[16] Therefore, the approval and authorization of this real estate investment advisory business are not compulsory.

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investigation by the investigating committee to verify the social experiment or full-fledged operations taking account of the status of implementation of full-fledged operations for lease transactions that commenced in FY2017 and the results of the investigation of the social experiment for transactions between corporations.

[12]"GEEO" (http://geeo.otani.co/), "Price Map" (http://www.homes.co.jp/price-map/), "IESHIL" (https://www.ieshil.com/), "Mansion Value" (https://mansionvalue.jp/), etc.

[13]"Gate." (https://gate.estate/), "VALUE" (https://value.heyazine.com/) "How-ma" (https://www.how-ma.com/), etc.

[14]Article 2, paragraph (1) of the Act on Real Estate Appraising and Valuation.

[15]Article 2, paragraph (2) of the Act on Real Estate Appraising and Valuation.

[16]"Persons engaged in the real estate investment advisory business may be registered as General Real Estate Investment Advisory Business or a Comprehensive Real Estate Investment Advisory

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Crowd funding Types
├─ Investment Type
│    ├─ Funds （Specified Joint Real Estate Ventures, Social lending in Japan）
│    ├─ Loan （Social lending in a narrow sense）
│    └─ Stock
├─ Purchase Type
└─ Donation Type
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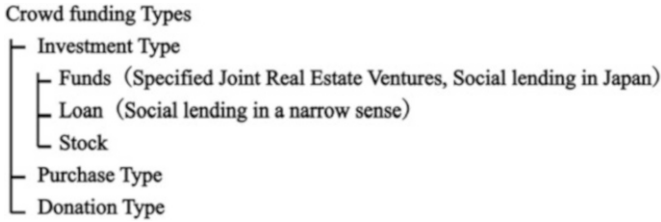
Fig. 21.1 Crowd Funding Types

21.2.3 Crowd Funding

"Crowd funding" is not something that is defined by law. Although there are definitions such as "schemes to link new and emerging companies with investors through internet sites to collect small amounts of funds from multiple investors,"[17] in practice, there is wide scope not limited to "new and emerging companies" including the case of collecting funds for identified business projects and purposes and the solicitation of funds not for investment purposes. In the context of Real Estate Tech in this paper, it is used to mean something like "a scheme to offer or solicit fund contribution for investment in real estate in the form of small units from multiple investors using the internet (Fig. 21.1)."

1. Specified Joint Real Estate Ventures

     An entity in a form that solicits investment by recruiting anonymous partnership (Tokumei-Kumiai) investment based on the Act on Specified Joint Real Estate Ventures[18, 19] (Fig. 21.2).

   (i) Approval and authorization

        If the business operator operates as a Specified Joint Real Estate Venture (so-called item (i) business) by receiving investment from investors in the

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Business in the Real Estate Investment Advisory Business Register maintained by the Ministry of Land, Infrastructure, Transport and Tourism as prescribed by these regulations" (Article 3 of the Regulations for Registration as a Real Estate Investment Advisory Business).

[17]Page 2 of the "Report of the Working Group on the Provision of Risk Money to Emerging and Growing Companies of the Financial System Council" dated December 25, 2013.

[18]While this could theoretically also refer to Special Ventures that use so-called SPC (Article 2, paragraph (6) of the Act on Specified Joint Real Estate Ventures), at the present point in time there is no such subdivided products for individual investors that actually use Special Ventures. In addition, there are also multiple examples of voluntary partnership subdivided instruments, but this paper assumes general anonymous partnership (Tokumei-Kumiai) subdivided instruments. Note that in the case of anonymous partnership (Tokumei-Kumiai) subdivided instruments, almost all cases are through offering and solicitation via the actual business owner's own website ("Business owner" = "Platform provider").

[19]"Surf Series" (http://www.sumitomo-rd.co.jp/fund/), "Mullion Bond" (https://www.mullion.co.jp/), "TATERU UNDING" (https://www.tateru-funding.jp/), etc.
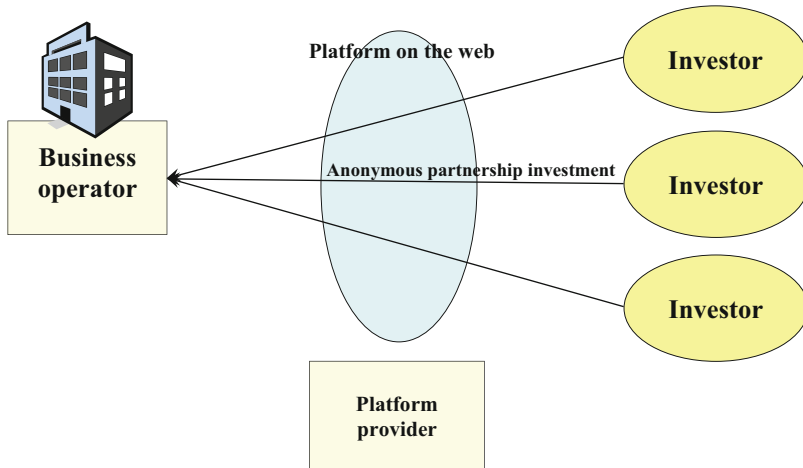
Fig. 21.2 Specified Joint Real Estate Ventures Structure

form of anonymous partnership (Tokumei-Kumiai) investment, and conducting real estate transactions such as sales and lease of real estate with such investment funds, then distributing the profit generated from such real estate transactions to investors, a permit needs to be obtained in accordance with the Act on Specified Joint Real Estate Ventures. There are requirements for a permit to be approved as an item (i) business such as capital requirements (100 million yen), a license under Building Lots and Building Transaction Business Act, and a requirement on personnel structure. Investment interests in anonymous partnership (Tokumei-Kumiai) pertaining to Specified Joint Real Estate Ventures (item (i) business) are excluded from being deemed securities under the Financial Instruments and Exchange Act,[20] so business operators and platform providers do not have to be Type II Financial Instruments Business.

Note that the revised Act on Specified Joint Real Estate Ventures established in May 26, 2017, and promulgated on June 2 that year establishes a system for "Small Specified Joint Real Estate Ventures" with total investment below a certain level, and it is anticipated to mitigate the capital requirements for operating a Small Specified Joint Real Estate Venture.[21]

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[20] Article 2, paragraph (2), item (v) c of the Financial Instruments and Exchange Act.

[21] The total investment amount and mitigated capital requirements for small business is scheduled to be specifically prescribed in governmental and ministerial ordinance to be introduced in future, but the Report of the Advisory Board on Real Estate Investment Market Policy, released on September 16, 2016, mentions that the "capital requirements are anticipated to be about 1000 million yen for both item (i) business operators and item (iii) business operators. Note that the revised Act is to be enacted within 6 months of the date of promulgation.

(ii) Possibility of issuing documents via electromagnetic means

If aiming to execute a Specified Joint Real Estate Ventures contract pertaining to a Specified Joint Real Estate Ventures (item (i) business) (e.g., anonymous partnership (Tokumei-Kumiai) contract), there are provisions that require the delivery of documents that mention certain legal matters before the conclusion of the contract and at the time the contract is concluded.[22] However, the issuance of such documents solely through electromagnetic means on the Internet is not approved under existing laws.

On this point, in the draft revision of the Act on Specified Joint Real Estate Ventures referred to above in (1), it is planned to allow for provisions concerning procedures on the Internet for documents prior to the conclusion of the contract.

(iii) Number of people required for offering and solicitation

As mentioned in (1) above, anonymous partnership (Tokumei-Kumiai) investment interest pertaining to Specified Joint Real Estate Ventures (item (i) business) is excluded from being deemed securities under the Financial Instruments and Exchange Act, so disclosure regulations under the Financial Instruments and Exchange Act do not apply to the solicitation and offering of such anonymous partnership (Tokumei-Kumiai) investment interest. Therefore, even if there are more than 500 investors involved in the solicitation and offering of such anonymous partnership (Tokumei-Kumiai) investment interest, it will not correspond to "offering" (so-called public offering) under the Financial Instruments and Exchange Act, and there will be no obligation to create a securities registration statement, etc. In addition, the Act on Specified Joint Real Estate Ventures does not prescribe restrictions on matters such as the number of people for solicitation and offering or other disclosure regulations. This can be considered fit for crowd funding that collects small amounts of funds from multiple investors.

2. Social lending[23]

Social lending is essentially the mediation of funds from lenders and borrowers through an internet platform, with funds solicited in the form of a cash consumer loan (Fig. 21.3), but in Japan it is highly likely that individual investors as lenders will need to register as money lenders under the Money Lending Business Act, so in practice, funds are currently solicited in the form of "an anonymous partnership (Tokumei-Kumiai) investment for a loan business conducted by a business operator," as shown in (Fig. 21.4).[24]

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[22]Article 24 and Article 25 of the Act on Specified Joint Real Estate Ventures.

[23]Also referred to as P2P lending, or loan type crowd funding, etc.

[24]24 "LC Lending" (https://www.lclending.jp/) and "OwnersBook" (https://www.ownersbook.jp/) and others that target domestic real estate for collateral and "Gaia Funding" (https://www.gaiafunding.jp/ and others that target foreign real estate for collateral.
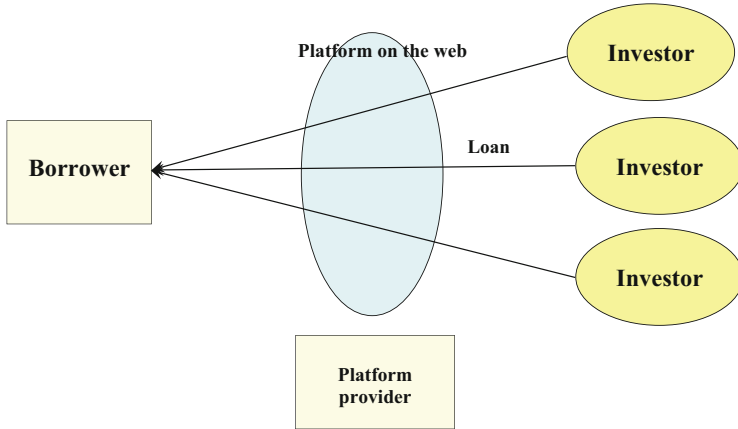
Fig. 21.3 Social Lending Structure
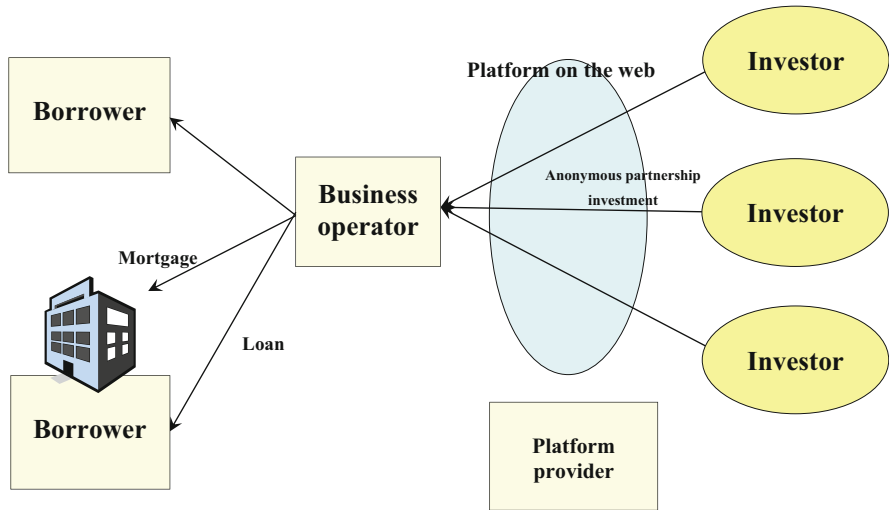
Fig. 21.4 Social Lending Structure in Japan

(i) Approval and authorization

Platform providers (=intermediaries) handle private placements for anonymous partnership (Tokumei-Kumiai) investment as a business and are required to be registered as a Type II Financial Instruments Business.[25]

Business operators (=business operators and lenders) that conduct private placements (self-offering)[26] of anonymous partnership (Tokumei-

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[25]Article 2, paragraph (8), item (ix) of the Financial Instruments and Exchange Act.

[26]Article 2, paragraph (8), item (vii) of the Financial Instruments and Exchange Act.

Kumiai) investment interest must essentially be registered as Type II Financial Instruments Business, yet registration is not required if they entrust the handling of private placements to platform providers that are Type II Financial Instruments Business Operator. In addition, in principle, registration as a money lender is required as it is in the business is lending.[27] However, it is not regarded a money lender if lending is only to its own subsidiaries, etc.[28]

Investors are not required particular approval and authorization. However, it appears that administrative agencies point out concerns about the substantive financial judgment of the investor if the borrower of the loan for the target investment is identified (therefore, the Money Lending Business Act applies to the investor). On this point, in practice, measures seem to be taken where the borrower of the business operator's loan is anonymized, the loans are handled as if multiple loans. Certainly, one of the intentions of requiring lenders to be registered as money lenders under the Money Lending Business Act is to regulate the collection activities of the lenders toward the borrowers. So from that perspective the request for practical fulfillment of such regulation even for investors in social lending might as well be recognized. However, even in the case of investment instruments like securitized loan claims, for example, there are also other investment instruments where the borrowers are identified, so requiring anonymization of borrowers and multiple loans for social lending appears to be excessive regulation from the perspective alone of such intent. Rather, from the perspective of information disclosure to investors, it would be better to solicit investment after identifying the borrower and the target real estate. In addition, it is also pointed out that there have been examples[29] of inappropriate explanations and operations regarding the borrowers and the use of funds.

(ii) Possibility of issuing documents via electromagnetic means

Unlike the Act on Specified Joint Real Estate Ventures, the Financial Instruments and Exchange Act already permits the issuance of documents before and when executing a contract by electromagnetic means with the consent of investors.[30]

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[27]Article 2, paragraph (1) of the Money Lending Business Act.

[28]Article 2, paragraph (1), item (v) of the Money Lending Business Act, Article 1–2, item (vi) of the Order for Enforcement of the Money Lending Business Act.

[29]The results of the investigation of Minnano Credit Co., Ltd. by the Securities and Exchange Surveillance Commission was the recommendation of administrative procedures, which was an example of administrative procedures from the Kanto Local Finance Bureau (order to suspend operations for 1 month, and operation improvement order).

[30]Article 37-4, paragraph (2), Article 37-5, paragraph (2), Article 34-2, paragraph (4) of the Financial Instruments and Exchange Act; Article 56 of the Cabinet Office Order on Financial Instruments Business, etc.

(iii) Number of people requirement for offering and solicitation

Unless an anonymous partnership (Tokumei-Kumiai) investment interest invests more than 50% of raised funds in a securities investment, it is not subject to disclosure regulation (in the main paragraph of Article 3, item (iii) of the Financial Instruments and Exchange Act, collective investment scheme interest (rights listed in Article 2, paragraph (2), item (v)) is not subject to disclosure regulation, while in the provisions of Article 3, item (iii) and only those that are mainly invested in securities are subject to disclosure regulation as an exception). Therefore, even in the case of offering and solicitation for more than 500 investors, this does not correspond to a public offering, and there is no need for a securities registration statement. However, in the case of 500 or more investors, the documents to be delivered before concluding contracts must be submitted to the Prime Minister in advance.[31]

21.2.4 Future Issues

1. Grant of Benefits, etc. other than Economic Considerations

Crowd funding, which is a scheme for collecting small amounts of funds from a large number of multiple individuals, is a mechanism that is fit not just for the purpose of pure yield but for soliciting funds from supporters and fans for some sort of business and purpose.

On this point, for example, the service provided by large American crowd funding companies include the grant of non-economic compensation benefits such as special discounts to investors as "owners" of the hotel or restaurant to be developed,[32] and the test marketing functions prior to the formal commencement of the project to developers[33] in addition to the purpose of pure yield or for the procurement of funds.

In this way, in Japan, too, in the context of cultivating regional areas and regional activation as well as the use of public real estate, even when a property or project could not necessarily be considered highly profitable, for example, there is expected to be funds that will provide returns in the form of "return + alpha" for those individuals who are from the region or who are motivated to contribute funds for non-yield return purposes such as users or potential users of the services (medical services, childcare services, etc.) of such real estate (Fig. 21.5).

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[31] Article 37-3, paragraph (3) of the Financial Instruments and Exchange Act, Article 16-2 of the Order for Enforcement of the Financial Instruments and Exchange Act.

[32] "RealtyMogul" (https://www.realtymogul.com/).

[33] "FUNDRISE" (https://fundrise.com/)). Note that FUNDRISE reportedly raised $2.5 billion through crowd funding as part of the funds to develop the 3 World Trade Center development project in the United States.
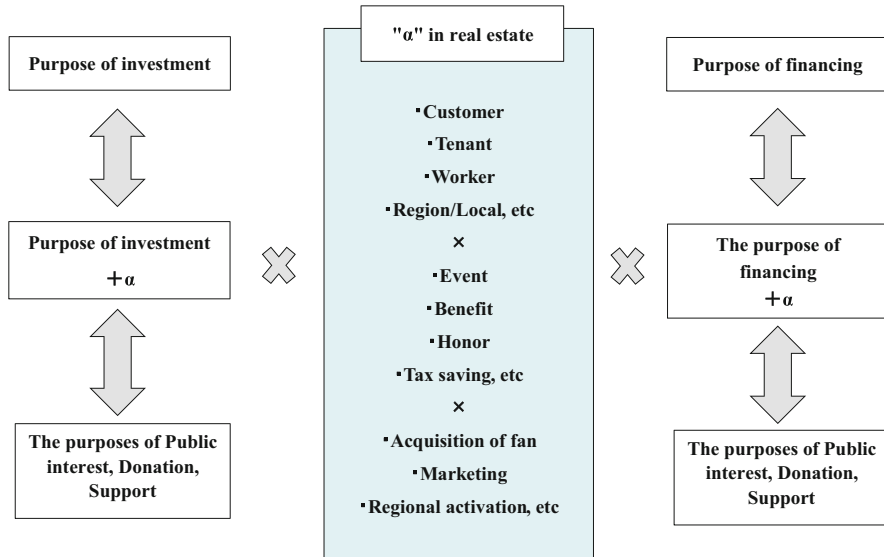
Fig. 21.5 Benefits, etc. other than Economic Considerations

2. Procedures for identification in accordance with the Act on Prevention of Transfer of Criminal Proceeds

The business operator who operates Specified Joint Real Estate Ventures in accordance with the Act on Specified Joint Real Estate Ventures and Type II Financial Instruments Business Operators who are platform providers for social lending correspond to business operators that are identified in the provisions of the Act on Prevention of Transfer of Criminal Proceeds. Therefore, their transactions relating to the operations for the respective crowd funding when conducted between investors require confirmation of identity in accordance with the Act on Prevention of Transfer of Criminal Proceeds.[34]

On this point, in case of non-face-to-face transactions with individuals conducted via the Internet, the method for confirming identity shall, except for the method using digital certificates,[35] be either the method of forwarding transaction documents, to the address of the individual mentioned in the identity documents by non-transferable postal mail that must be returned when undeliverable, such as registered mail, or the method of sending transaction

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[34] Article 2, paragraph (2), item (xxi) and item (xxvi) of the Act on Prevention of Transfer of Criminal Proceeds; Article 6, item (i) and item (x), and Article 7, paragraph (1), item (i), (i) and (m) of the Order for Enforcement of the Act on Prevention of Transfer of Criminal Proceeds.

[35] Article 6, paragraph (1), item (i), (g), (h) and (i) of the Ordinance for Enforcement of the Act on Prevention of Transfer of Criminal Proceeds.

documents that can only be delivered to the person him or herself,[36] and it is vital that this exchange occur offline.

Completing all the procedures via the Internet is considered desirable for crowd funding, which is a scheme of collecting very small amounts of funds from a large number of multiple individuals. In addition, when investigating the possibility of soliciting the contribution of funds from overseas investors in cross-border transactions, there is no denying that the current confirmation of identity procedures in accordance with the Act on Prevention of Transfer of Criminal Proceeds could be a cause of obstruction and we hope that there will be future revisions that include exemptions according to the amount of funds, etc.

3. Investment and distribution through cryptocurrencies

For anonymous partnership (Tokumei-Kumiai) investment type Specified Joint Real Estate Ventures and for social lending, there is an assumption that the investment will be made by "cash or other property."[37]

On this point, although the discussion on the legal nature of so-called cryptocurrencies such as Bitcoin remains unsettled, it is highly likely that they could correspond to "property."[38] In that case, there could conceivably be funds that are invested using cryptocurrencies with the profit distributed using cryptocurrencies. Furthermore, in that case, it would theoretically be possible to constitute distributed or autonomous real estate funds on the Internet that use smart contracts via blockchain technology. Urgent investigation is required concerning the case of transactions that use such cryptocurrencies not only from their legal treatment but how they should be treated for accounting and tax purposes and whether or not there is a withholding tax obligation.

4. Data analysis and analytical service

There are services that analyze stores by applying artificial intelligence to existing data such as POS and in-store data such as the number of customers and the stay dynamics that can be obtained by analyzing images from multiple cameras installed in the store for the purpose of increasing sales and reducing costs.[39]

5. Service to improve the efficiency of operations

There are service types provided to real estate operators that improve the efficiency of operations such as real estate property information filtering service

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[36] Article 6, paragraph (1), item (i), (b), (e) and (f) of the Ordinance for Enforcement of the Act on Prevention of Transfer of Criminal Proceeds.

[37] Article 2, paragraph (2), item (i) of the Act on Specified Joint Real Estate Ventures, Article 535 and Article 536, paragraph (2) of the Commercial Code.

[38] Yoshihiro Kataoka "Regulation and legal issues for cryptocurrency (Vol 1.)" NBL No. 1076 (2014), page 58 +, etc.

[39] "ABEJA Platform" (https://service.abeja.asia/).

(information browsing and service to improve the efficiency of management operations)[40] and cloud services for real estate management.[41]

6. Virtual reality (VR) technology

VR technology and real estate are thought to have comparatively high affinity. For example, there are services[42] that make it possible to view the state of a vacant plot of land and a property under construction as if the property that is planned has already been constructed as well as displaying the view from the balcony or verandah.

21.3 Legal Issues Concerning Information and Big Data

When compared to the United States and elsewhere, the current Japanese real estate secondary market is noted as being inadequate in terms of the system of registration, disclosure, and utilization of real estate price information, property information, and transaction information, such as the Real Estate Information Network System (REINS).

On this point, each business operator that attempts to evaluate real estate values using AI, etc. would utilize enormous sample data by analyzing the property information that it has independently accumulated and obtained other than what is publicly available.

The following investigates the legal issues in using and obtaining such property information.

21.3.1 The Act on the Protection of Personal Information[43]

"Personal Information" is the information relating to a living individual that can identify the specific individual by name, date of birth, or other descriptions contained in such information (including such information as will allow easy reference to other information and will thereby enable the identification of the specific individual) or something that includes an individual identification code[44] in (1) or (2) below.

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[40]"data terminal" (https://terminals.jp/product/dataterminal.html).

[41]"Property Databank" (https://www.propertydbk.com/).

[42]"Miraie 360" (https://miraie-net.com/360/?utm_source=yahoo&utm_medium=cpc&utm_campaign=360) "FINE"
(http://www.fine-d.co.jp/service/housingvr.html). "SHOWRISE" (https://oh.openhouse-group.com/company/news/news20160527.html), etc.

[43]Revised law enacted May 30, 2017.

[44]Article 2, paragraph (1) of the Act on the Protection of Personal Information.

1. Codes into which a bodily partial feature of the specific individual has been converted in order to be provided for use by computers.
2. Codes which are differently assigned in regard to the use of services provided to an individual, to the purchase of goods sold to an individual, or to the documents issued to an individual.

If information data that includes Personal Information is to be used in the development of AI by applying such information or data, or sold as a data set to a third party, it should be subject to the restriction of the purpose of the use or of the provision to third parties in accordance with the Act on the Protection of Personal Information.[45]

On this point, the Revised Act, enacted on May 30, 2017, introduced the concept of "Anonymously Processed Information" for the purpose of enabling the utilization of Big Data. Anonymously Processed Information means information relating to an individual that can be produced from processing Personal Information so as neither to be able to identify a specific individual nor to be able to restore the Personal Information.[46] The specific processing method should be in accordance with the "Guidelines on the Act on the Protection of Personal Information (Anonymously Processed Information)" released by the Personal Information Protection Commission.

The use of Anonymously Processed Information and its provision to third parties does not require individual consent pertaining to the raw Personal Information, so it is expected that the utilization of Big Data will be promoted.

21.3.2 Contractual Obligation of Confidentiality and Restrictions on the Purpose of Use

There could be a problem with the use of information even if it does not correspond to "Personal Information" under the Act on the Protection of Personal Information if such information is obtained for a transaction based on some form of contract and there is an obligation of confidentiality such as the prohibition of disclosure of such information to a third party or restriction on the purpose of use, if such information is used or provided to a third party in breach of such obligation of confidentiality.

This point is ultimately a problem of interpretation of the contract which makes it difficult to judge if there is a breach of the obligation of confidentiality due to uniform interpretation and operation. However, my personal opinion is that in the case of such information that is processed in the similar way to Anonymously Processed Information and cannot be traced back to identify the raw property or

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[45]Article 16, paragraph (1) and Article 23, paragraph (1) of the Act on the Protection of Personal Information.
[46]Article 2, paragraph (9) of the Act on the Protection of Personal Information.

the relevant party, there could be scope to interpret such information as being outside the scope of application of the obligation of confidentiality in relation to the use of such information or the provision to a third party following such process.

Of course, the judgment of legality ultimately depends on the courts, but it is hoped that the authorities present certain interpretative guidelines from the perspective of promoting the utilization of real estate property information.

21.3.3 Crawling

Crawling refers to a program that patrols websites on the Internet and automatically collects an enormous volume of data by duplicating and saving the information on each website. Real estate property information on the Internet can be collected through such crawling.

In terms of the legality of such crawling, first, in the case of information and data that is automatically collected and deemed to be works protected under the Copyright Act, duplication without permission is illegal. In addition, in certain cases, such information and data could also be protected as a trade secret in accordance to the Unfair Competition Prevention Act.

However, for example, in the case of information and data sets that are not specifically approved as intellectual creations[47] and such that information and data are widely available to the general public on the Internet, it will not correspond to either a copyrighted work or a trade secret. Even in such case, whether there is legal restriction on crawling will in certain cases result in crawling itself being an illegal behavior, and a claim for damages could be approved.[48] In my personal opinion, this possibility cannot be denied.

The judgment on the legality of crawling will ultimately depend on the judgment of individual specific court cases, but from the perspective of promoting the utilization of real estate property information, we expect the authorities to present certain interpretative guidelines from the perspective of promoting the utilization of real estate property information.

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[47]Apart from the case of being recognized as an intellectual creation as a literary work (Article 10, paragraph (1), item (i) of the Copyright Act), there is also the case of database works (Article 12–2 of the Copyright Act) as an intellectual creation for the selection or systematic construction of information.

[48]Tatsuhiro Ueno "Legal Protection of Automatically Collected Big Data," *Patent* Vol. 70 No.2 (2017), page 33.

21.4   Conclusion

We could say that Real Estate Tech services in Japan are still in their dawning stage, but the main underlying trend is undeniably one whereby services and operations are being developed that will surpass common practice within the traditional real estate industry through use of the Internet, other ICT technology and AI, and such other programs. So the next issue will be the speed of such development and permeation. The main contributing factor to such speed will be the extent to which the thinking and attitudes of existing real estate operators (i.e., of the people in the industry, in particular, major business operator) take the initiative in confronting Real Estate Tech, and the issue of sorting out the environment (including the legal system and interpretation), such as the problem of collecting information and data such as real estate property information. In the future, business operators from other industries and overseas business operators could enter the domestic real estate market, and both real estate business operators and the governmental authorities will need to move rapidly to deal with such a situation.

Chapter 22
Proposal of System for Calculating Sky View Factor Using Google Street View

Shoko Nishio and Fumiko Ito

Abstract In recent years, big data entered use in various fields. Google Street View (hereinafter called "GSV") can be regarded as open big data, and its images can be obtained using API. The streets can be viewed 360° horizontally and 290° vertically from each point on the web. In addition to those, zooming up is available, and the viewpoint can be moved approximately 10 m forward or backward to/from the current point. The original image to provide the view is the panoramic image associated with the latitude and longitude information on the street consecutively at intervals of 10 m, and they exist as massive data on the web. We determine the area of the sky using these images from GSV. In this research, we calculate the sky view factor (hereinafter called "SVF") in an extended area by defining the area of the sky with the SVF and utilizing the computer.

Keywords Sky view factor · Google street view · Use districts · Road width

22.1 Introduction

22.1.1 Background and Purpose

In accordance with the remarkable development of computers and the internet in recent years, big data entered use in various fields, including medical field, education, transportation, energy, housing, and urban development. Google Street View (hereinafter called "GSV") [1] can be regarded as open big data, and its images can be

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This paper is recomposed according to the content of Nishio and Ito (2014).

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[1]GSV is a service started on May 25, 2007, in the United States and August 5, 2008, in Japan by Google, which offers 360° panoramic views.

S. Nishio (✉) · F. Ito
Department of Urban Science and Policy, Tokyo Metropolitan University, Tokyo, Japan
e-mail: snishio@tmu.ac.jp; itofumi@tmu.ac.jp

obtained using API. The streets can be viewed 360° horizontally and 290° vertically from each point on the web. In addition to those, zooming up is available, and the viewpoint can be moved approximately 10 m forward or backward to/from the current point. The original image to provide the view is the panoramic image of the horizontal direction of 360° and vertical direction of 290°. Each image is associated with the latitude and longitude information on the street consecutively at intervals of 10 m, and they exist as massive data on the web. We determine the area of the sky using these images from GSV. In this research, we calculate the sky view factor (hereinafter called "SVF") in an extended area by defining the area of the sky with the SVF and utilizing the computer.

The SVF was introduced as the concept of the easing of the restriction of the oblique line when Japan's Building Standards Act was revised in 2003, which indicates the amount of the sky to the hemispherand in the equisolid angle projection (Fig. 22.1). Generally, the method with the software, such as JWCAD, is used to

Fig. 22.1 Definition of SVF
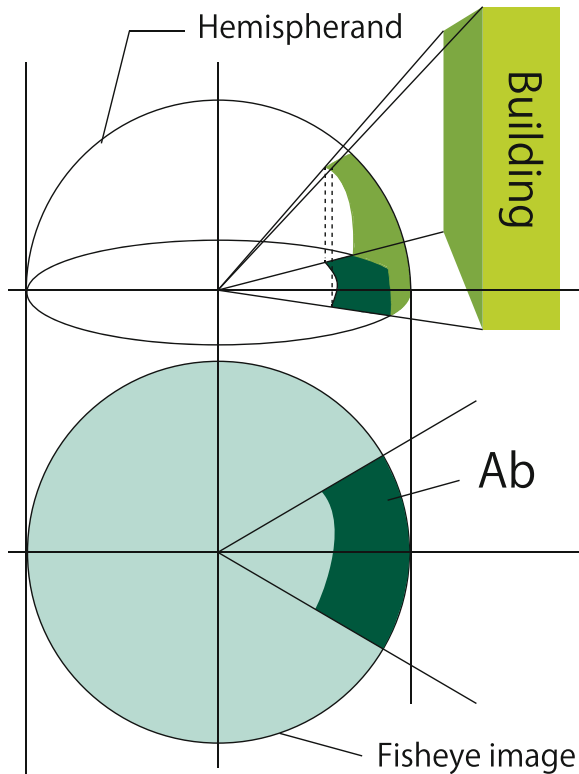
Horizontal projection area of hemispherand = Area of circle(As)

$$SVF=(As-Ab)/As$$

calculate the SVF. Furthermore, the method using the digital camera with the fisheye lens equipped to photograph the fisheye image is used in previous researches (Takei and Ohara 1977; Ito et al. 2005). These methods are effective for calculating the SVF accurately at a single point. On the other hand, Ministry of the Environment (2003) calculates the SVF by modeling the building arrangement within the 500 m mesh. These methods are effective when understanding the distribution of the SVF in an extended area.

As explained above, there are a variety of methods to calculate the SVF; however, none of them satisfy both conditions, in detail and in an extended area, to calculate the SVF at sequential points on the streets. Therefore, we suggest the system in this paper, which calculates the SVF automatically by converting the panoramic images from GSV to the fisheye images. The purpose of this study is to suggest the new system which allows the calculation of the SVF both in detail and in an extended area.

Acquiring the SVF in an extended area and in detail makes it easier to compare and analyze it with the psychological indicator, such as a feeling of oppression on the streets, and the forming, characteristics, and form restriction of the streetscape in an extended area. Moreover, we believe that releasing this system makes it possible for everyone to calculate the SVF anywhere within the photograph points of GSV, and there is a possibility of the development from the perspective of the big data utilization.

22.1.2 Definition of SVF

Definition of SVF in This Paper

The definition of the SVF in this paper is the amount of the visible sky to the whole sky at arbitrary measurement point shown in the equisolid angle projection. There are two differences from the general definition of the SVF. The first one is what is regarded as the "visible sky." Whereas it is the ratio of the sky in the condition with only the building to be constructed in Japan's Building Standards Act, it is the ratio of the visible sky to the whole sky in the condition with all buildings, planting, telegraph poles, and signs in this research. The second one is the measurement point. Because the SVF is calculated from GSV, the measurement point is the center of the road at the height of 2.45 m or 2.05 m. As described above, the SVF which is dealt with in this research is different from the one in Building Standards Acts in Japan: however, we use it following other previous researches.

SVF Calculation Using the Fisheye Lens

We compared the SVF calculated from GSV with the one calculated using the fisheye lens in order to verify the consistency. The images were photographed

Fig. 22.2 Example of fisheye image

using the converter (NikonFisheyeConverterFC-E8) attached to the compact digital camera (NikonCOOLPIX4500) and the tripod (SLIKPRO330DX II) in the equidistant projection at each measurement point. They were converted to the orthograph using SPCONV (n.d.) to create fisheye images (Fig. 22.2). The SVF calculated with the above steps is defined as true.

22.2 Method for Calculating SVF

22.2.1 Overview of Calculation Method (Fig. 22.3)

This system consists of two programs: (1) a program which acquires the latitude, longitude, and PanoID information from GSV and (2) a program which acquires and saves the corresponding panoramic image with PanoID and calculates the SVF with the image processing (Fig. 22.3). PanoID is the number which is given to each 360° panoramic image of GSV. We implemented the program (1)[2] to the web browser (http://www.comp.tmu.ac.jp/fiweb/itoken/nishi/panoindex.html), which can acquire and generate the list of the PanoID, latitude, and longitude information of the point where the panoramic image was photographed in an extended area. The program (2) then acquires the corresponding panoramic image (mercator projection) with PanoID, performs the edge detection with the image processing, and creates the binary image of the area of the sky and the one of the others. In the next place, the image was converted in the orthograph, and the ratio of the visible sky to the whole sky was calculated. Automatizing these steps makes it possible to calculate the SVF at intervals of 10 m in an extended area.

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[2]Google Maps API Terms of Service (n.d.) is complied with.

Program 1
Create a web page that can acquire the data of latitude, longitude, and PanoID from GSV

http://www.comp.tmu.ac.jp/fiweb/itoken/nishi/panoindex.html

Longitude	Latitude	PanoID
35.659459	139.700556	LiMkgjWYVCBUyVqLpdrFMQ
35.659469	139.7004	msn9rtzBgPx5XoC_YXrGdQ
35.659372	139.700473	G5Zc99dCoSWVaGxXyuXd8Q
35.65945	139.700733	jhYJ0nrs5BeKnOAREVv4ww
35.659558	139.700544	fBmdFULPcUyN-g_zAzA0og

④Calculate the SVF

Calculate the percentage of the number of the pixels in the sky area (white) to the one in the whole area (circle)

67.2% for this example→

⑤Add to the list

Longitude	Latitude	PanoID	SVF
35.659459	139.700556	LiMkgjWYVCBUyVqLpdrFMQ	37.0718073
35.659469	139.7004	msn9rtzBgPx5XoC_YXrGdQ	**67.2093421**
35.659372	139.700473	G5Zc99dCoSWVaGxXyuXd8Q	
35.65945	139.700733	jhYJ0nrs5BeKnOAREVv4ww	

Go back to (1) to calculate the next PanoID
(G5Zc99dCoSWVaGxXyuXd8Q in this example)

Program 2
Acquire and save the corresponding panoramic image with PanoID and calculate the SVF with image processing

①Acquire and save the corresponding panoramic image with PanoID

416px
110px
Cut the area to use

②Process the image to extract the sky area

Convert the cut image to grayscale

Edge detection

Dilate the edge once

Erode the dilated edge once

③Convert the projection method

Fill the area above the edge with white and below with black to create the binary image

Convert the binary image (the mercator projection) into the orthographic projection using the conversion equation

Fisheye image

Cylinder made with the rolled up 360° panoramic image of GSV

Conversion equation
$$R = \frac{w}{2\pi}$$
$$X = R \cdot \theta,$$
$$Y = \frac{R}{r} \cdot \sqrt{R^2 - r^2}$$

hemispherand

Fisheye image

Fig. 22.3 Overview of SVF Calculation System

22.2.2 Creation of List of PanoID, Latitude, and Longitude

Firstly, the following specifications were implemented on the web browser (http://www.comp.tmu.ac.jp/fiweb/itoken/nishi/panoindex.html) using Google Maps API V3 within HTML by JavaScript. The latitude, the longitude, and PanoID are described with a focus on it at the bottom of the browser screen when arbitrary point is clicked (Program 1 in Fig. 22.3). Additionally, the specification is implemented which repeats the description of the GSV points automatically and continuously. The point whose information was already acquired was stored to the memory in order to avoid acquiring it from the same point. The latitude, longitude, and PanoID were described in each sentence at the bottom of the browser screen and copied to the text file for further analysis. It is noted that according to the limitations on the use of Google Maps API, the number of times the images can be read is restricted to up to 25,000 times per API per day. The images should be obtained within the limitation.

22.2.3 Method for Extracting Sky by Image Processing

The panoramic image (512 px × 512 px) was acquired, and the area necessary for the SVF calculation (416 px from the top left to the right and 110 px to the bottom) was
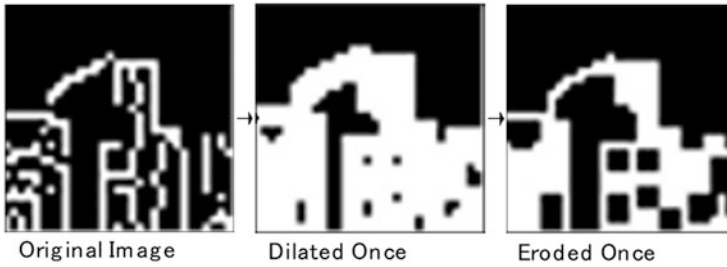
Fig. 22.4 Closing (enlarged image)

cut automatically using Python in order for each PanoID. The panoramic image of the point (RGB color) was converted to the grayscale image to make the image processing easy. The edge detection was then performed. The edge was dilated, and a process called closing, which erodes the dilated edge, was conducted because it is significant for this edge detection to prevent the disconnection of the edge between the areas of the sky and the others. As seen in Fig. 22.4, the liner breaks were connected, the edge between the areas of the sky and the others was detected, and the binary image was created to detect the sky ((1) and (2) of Program 2 in Fig. 22.3).

22.2.4 Conversion of Projection Method and Calculation of SVF

The panoramic image was photographed in the mercator projection. The projection method of the fisheye image is the orthographic projection, where the image displayed on the hemispherand is projected longitudinally. We defined the length of the panoramic image as h, the width of it as w, the height of the cylinder as h, and the circumference of it as w.

The conversion equation from the panoramic image to the fisheye image is described as follows. We defined an arbitrary coordinate on the panoramic image as (X, Y), the corresponding point on the fisheye image as $r{\cdot}\sin\theta$ in the polar coordinate, and the radius of the hemispherand as R. The following relation is confirmed between the combination of X and Y and that of r and θ.

The SVF was calculated by counting the number of the pixels in the sky area (white) to the one in the whole area (circle) on the fisheye image converted using the above equation. For the above steps, the list output of the latitude, the longitude, PanoID, and the SVF for the acquired data was obtained ((3), (4), and (5) of Program 2 in Fig. 22.3).

Fig. 22.5 Created fisheye
image

Fig. 22.6 Photographed
fisheye image

22.2.5   Analysis of Consistency

The consistency of the results of the proposed system is verified visually and numerically. Firstly, it is visually verified whether the fisheye images created using the system proposed in this paper (example in Fig. 22.5) coincide with the ones photographed with the fisheye lens (example in Fig. 22.6). While there seems to be minor differences, the fisheye images are consistent overall. The minor differences include the smaller extension of the buildings toward the center compared to the fisheye image photographed with the fisheye camera. It is considered that there may be an issue with the height of the cylinder, which we defined, and we would like to work on it. Secondly, we verified with the values. When we compare the values between the SVF calculated from the fisheye images that are photographed with the fisheye lens and the one calculated with the system that is proposed in this study, the mean value of the errors between the two points with the SVF calculated is 1.2%, which is considered to be acceptable. It is assumed that the level of the errors varies from point to point. We aim to propose a more precise tool for the SVF calculation in future research by verifying the errors among points with the different factors, such as the shape, height, and width of the building, the road width, the building coverage ratio, etc.
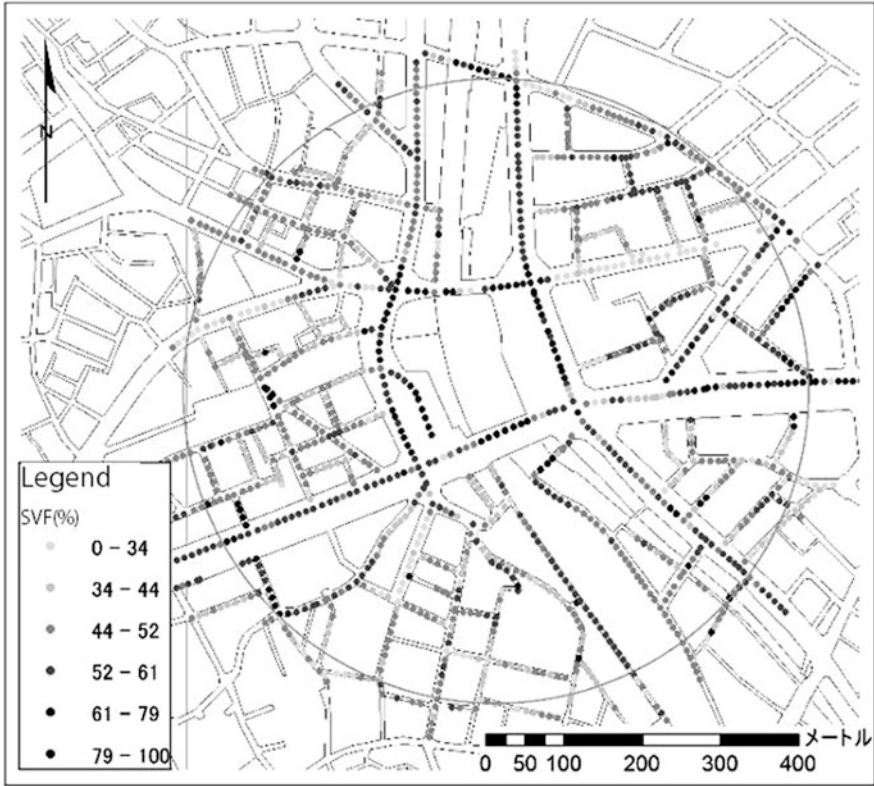
Fig. 22.7 SVF Map centered on Shibuya Station

22.3 Analysis of SVF Distribution in City

22.3.1 Creation of SVF Map

The SVF data which is associated with the latitude and longitude information is obtained in approximately 160 thousand points in the previous section, and it is imported to GIS and analyzed on the map. The data was obtained within 500 m of each station of 50 in total, 29 stations of JR Yamanote Line, 14 stations of JR Chuo Main Line, and 7 stations of JR Chuo Sobu Line, with their station building in the 23 wards. Among them, the points that appear to be unreliable are eliminated, and the SVF at approximately 130 thousand points is concerned in this section. The mean value of the SVF was 53.4%, the median was 51.1%, and the standard deviation was 13.6. As one of the examples, the distribution map of SVF around Shibuya Station is shown in Fig. 22.7.
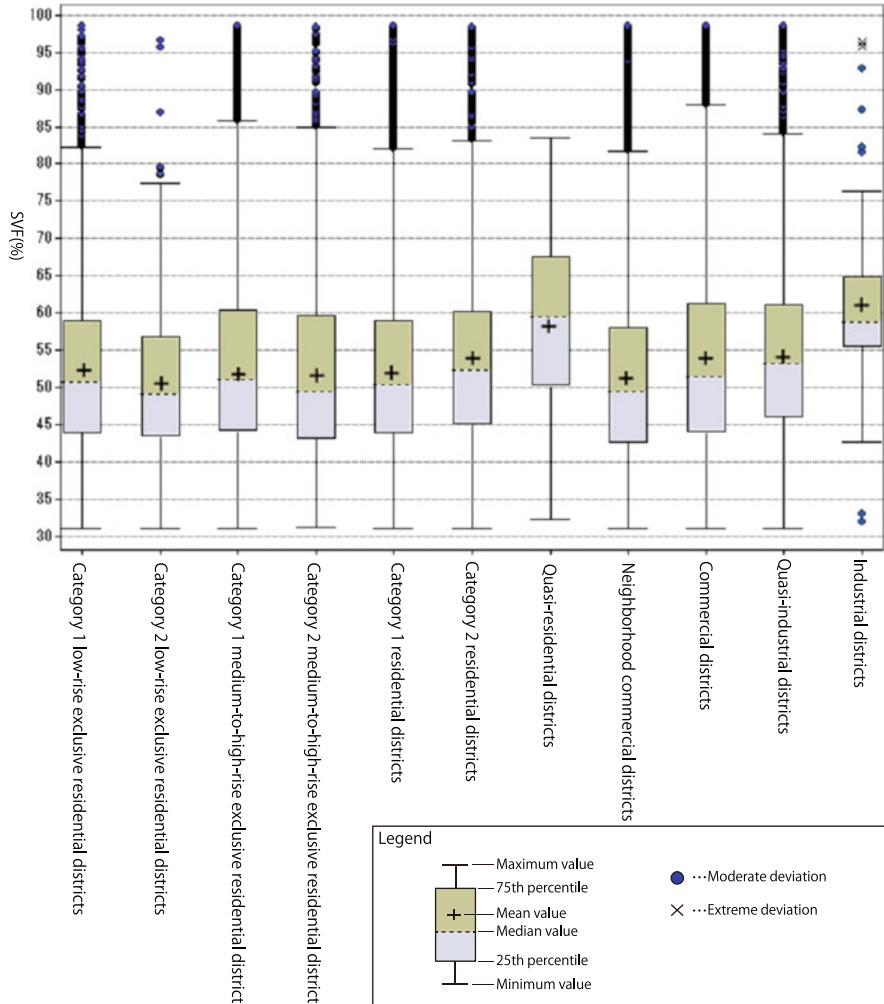
Fig. 22.8   Box plot of SVF by use districts

22.3.2   *Use Districts and SVF*

The figures, such as the floor area ratio and the height, are restricted based on the type of the use district. The relation between the use districts and the SVF is verified to clarify the difference of the SVF due to the level of the restriction. It is described in Fig. 22.8. Firstly, the high median and mean values of the SVF were confirmed in the quasi-residential districts among the residential districts. We consider it is because they are located along the relatively wide road. Secondly, the median and mean values of the SVF were higher in the commercial districts than the ones in the neighborhood commercial districts. We consider this is because of the tendency of

Table 21.1 Mean SVF of wide streets

Street name	Number of points	Mean value of SVF
Ome-kaido street	277	60.2
Kanpachi-dori street	281	63.8
Kototoi-dori street	330	60.6
Showa-dori street	238	58.5
Kokusai-dori street	159	65.3
Otakebashi-dori street	56	60.5
Ogubashi-dori street	167	54.0
Yasukuni-dori street	145	63.4
Shinjuku-dori street	477	63.5
Sotobori-dori street	141	64.7
Sakurada-dori street	168	62.8
Dai-ichi Keihin street	314	69.0
Dai-ni Keihin street	191	58.2
Yamanote-dori street	470	60.2
Heiwabashi-dori street	140	57.3
Kuramae-dori street	277	65.4

the commercial districts being located along the arterial road, whose has the wide width. These results are obtained regardless of the fact that the commercial districts have lighter restrictions of both the use and form, and both the height and density of buildings are high. For the above reason, it is indicated that the SVF is especially related to the road width. Therefore, the relation between the road width and the SVF is analyzed in the next section.

22.3.3 Road Width and SVF

It is considered that the wider the road width is, the higher the SVF is. It is revealed that the mean value of the SVF of the points on the wide roads with the name[3] is high compared to the one of all the points (53.4%) (Table 21.1). For instance, the one of 277 points on Ome-kaido Street is 60.2%, and the one of 281 points on Kanpachi-dori Street is 63.8% (Fig. 22.9). The quantitative analysis is set to be conducted in further research. For the reason, it is indicated that although high-rise buildings are located, it is possible to keep the SVF high by ensuring the road width sufficiently. According to Japan's Building Standards Act, the floor area ratio and the restriction of the oblique line are defined as the form restriction by the use districts at the moment: however, we consider that the restriction and easing defined with the SVF are also effective.

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[3]Most of the high-standard roads were once highways in Japanese "Kaido," and they were named until today.
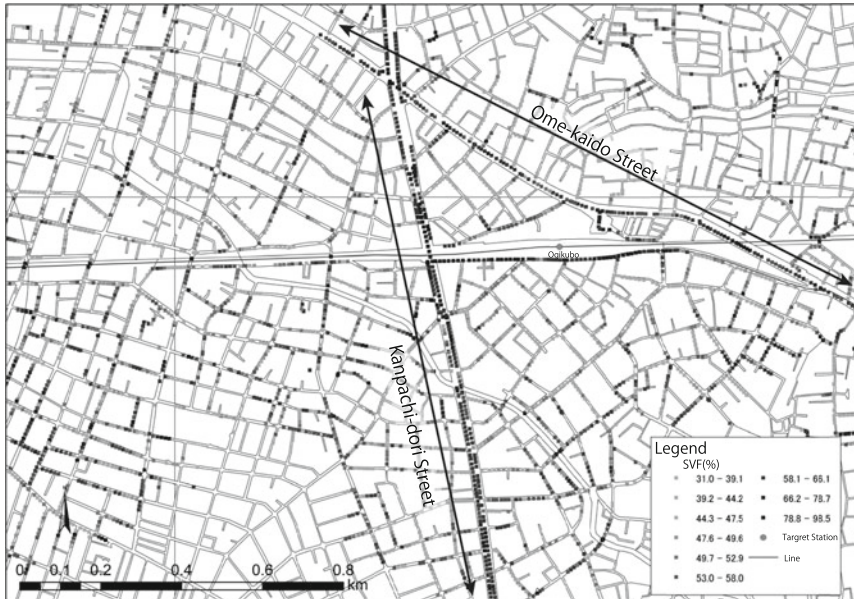
Fig. 22.9 Example of SVF on wide streets (Ogikubo Station Area)

22.3.4 Distance from the Station and SVF

We discuss the relation between the distance from the station and the SVF. No relation is revealed in terms of the points within 500 m of the station. Generally, there are many cases where high-rise buildings are often seen around the station, and more and more buildings with lower height and density are observed in accordance with the increase of a distance. Therefore, it is presumed that the bigger the distance from the station is, the higher the SVF is; however, such a tendency is not observed within 500 m. It appears that this is because the change point of the building use and arrangement is further than 500 m; therefore, we would like to expand the scope in further research.

22.4 Conclusion

The progress and use possibility regarding the construction of the system for calculating SVF are reported in this paper.

This system enables the SVF calculation at the points where GSV is disclosed. The generalization achieved by integrating subprograms and the accuracy improvement of the sky recognition regarding the image processing need to be addressed in the future.

The result of analyzing the SVF distribution in the 23 wards with this system suggests the tendency of a higher SVF at a wider road, which indicates the use possibility of the system.

The SVF at a number of points at intervals of 10 m is obtained by defining the panoramic image from GSV as big data. Although further analysis in detail is required, there is a possibility that the system will be substantially utilized for a new index of the urban planning and the town development according to the prospect of the restriction and easing with using the SVF.

We would like to improve the system to aim the elaboration and make it versatile and available for the public.

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Chapter 23
Frontiers of Computer Vision Technologies on Real Estate Property Photographs and Floorplans

Yoji Kiyota

Abstract This article describes frontier efforts to apply deep learning technologies, which is the greatest innovation of research on artificial intelligence and computer vision, to image data such as real estate property photographs and floorplans. Specifically, attempts to detect property photographs that violate regulations or were misclassified, or to extract information that can be used as new recommendation features from property photographs, were mentioned. Besides, this article introduces an innovation created by providing data sets for academic communities.

Keywords Deep learning · Computer vision · Real estate property images · Floorplans

23.1   Introduction

According to a recent survey in Japan (The Association of Real Estate Agents in Japan 2016), the proportion of home purchasers who collected real estate information using the Internet has reached 80% or more. Among various information posted on real estate information sites, property photographs are particularly important. In the questionnaire for users of the real estate information sites in Japan (Real Estate Information Site Business Liaison Council 2016), as a result of inquiring about important points (multiple answers allowed) when choosing real estate agents, 80.7% (first place) of the users chose "many photographs are posted", and 27.5% (fifth place) of the users chose "posted photographs are good" (Fig. 23.1). The result suggests a tendency that property photographs are very important for user experience. The tendency of increasing importance of property photographs can be observed not only in Japan but also in other major countries. Zillow (United States), Rightmove (United Kingdom), SouFun (China), and other major portal sites post a

Y. Kiyota (✉)
AI Strategy Division, LIFULL Co., Ltd, Tokyo, Japan
e-mail: KiyotaYoji@lifull.com
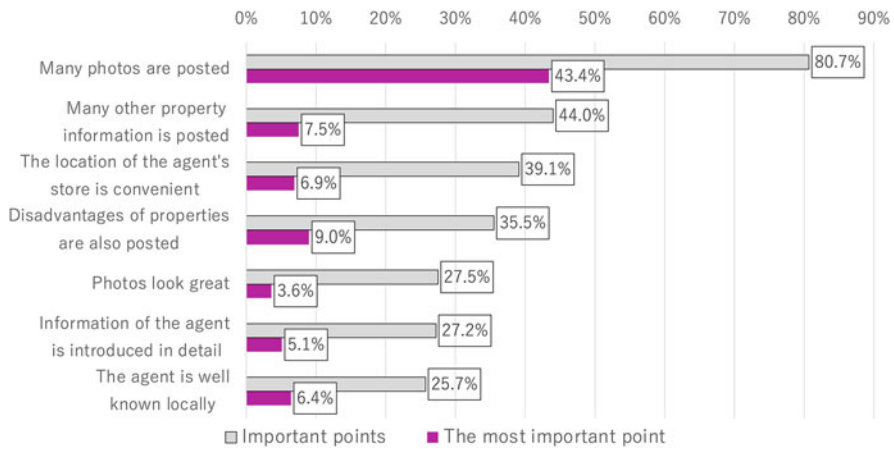
Fig. 23.1 Points which users of real estate information sites use when choosing agents (cited from p. 7 of the reference Real Estate Information Site Business Liaison Council (2016))

lot of high-quality photographs. In recent years, higher-value image data such as panoramic photographs and movies are also posted. However, there is considerable variation of quality for property photographs posted on real estate information sites, because taking photographs is up to each owner or broker.

A notable feature of real estate property information in Japan is the enhancement of floorplan images. On the real estate information site LIFULL HOME'S, more than 90% of property information is given floorplans. Further utilization of unique contents such as floorplans will also be important in revitalizing the Japanese real estate markets.

As described above, image information such as property photographs and floorplans is very important in the real estate markets, and there are urgent needs for innovation to increase the value of image information. In particular, research and development activities are becoming active all over the world on how to incorporate image processing techniques such as deep learning, which has been rapidly developing in recent years.

This article briefly describes the revolution that deep learning, which is said to be the biggest innovation in recent artificial intelligence research, has brought to the image processing field in Sect. 23.2, and then in Sect. 23.3, research activities on applying deep learning to real estate property photographs, including application to actual services, are introduced. Section 23.4 focuses on an attempt to generate more innovation by providing a large amount of real estate property photographs and floorplan image data to the informatics and computer science research communities. Finally, Sect. 23.5 describes prospects in the future.

23.2 Revolution of Image Processing Technology by Deep Learning

In recent years, there has been an increasing interest in artificial intelligence in society. Today, it is said to be the third artificial intelligence boom following the 1960s and 1980s. "Deep learning" is regarded as a key technology of the third artificial intelligence boom. This section refers to the significant impact that deep learning has had on image processing research.

Deep learning is a type of machine learning and an evolution of neural networks. Studies on neural networks started from imitating the human cranial nerve circuit, and its origin dates back to the 1940s (McCulloch and Pitts 1943).

The first boom on neural network studies began in 1958 with the perceptron (Rosenblatt 1958) published by Frank Rosenblatt. Although this perceptron (simple perceptron) has a simple structure with only two layers, an input layer and an output layer, as shown in Fig. 23.2, it attracted much attention at that time because it can learn and predict. However, Marvin Minsky, a famous artificial intelligence researcher, pointed out in 1969 that a simple problem using an exclusive OR (XOR) operation cannot be solved (Minsky and Papert 1969), and the boom once ended.

Subsequent studies showed that the XOR problem can be solved by inserting a hidden layer into a simple perceptron as shown in Fig. 23.3 to create a multilayer perceptron. Backpropagation, an efficient learning method for multilayered perceptrons, was proposed in 1986 by American cognitive psychologist David Rumelhart and others (Rumelhart et al. 1986), and the boom in neural network research began again. For example, a study in 1998 using the MNIST database,[1] which has been used for handwritten digit recognition tasks for evaluating machine learning algorithms, achieved high performance with an error rate of less than 2.5% with a three-layer perceptron (LeCun et al. 1998).

By the way, is it possible to use neural networks to recognize images that are much more complex than handwritten digits, such as real estate property photographs? It was said that increasing the number of layers could increase the learning ability of the neural network and recognize complex images, but if the number of layers increases, backpropagation will not work well. The result was inferior to other methods using human-designed image features. However, at the ILSVRC[2] 2012, a competition for image recognition research held in 2012, the University of Toronto's system SuperVision, which adopted a method developed from a neural network,

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[1]A data set consisting of a set of handwritten numeric images and correct numeric labels. Provided by the National Institute of Standards and Technology (NIST).

[2]ImageNet Large Scale Visual Recognition Challenge. A task is required computer to answer what objects (yachts, dogs, cats, flowers, etc.) are in the images. ImageNet is an image database maintained for the purpose of promoting research on image object recognition. More than 14 million image data associated with more than 20,000 synonyms (synsets) of WordNet, a concept dictionary of English.
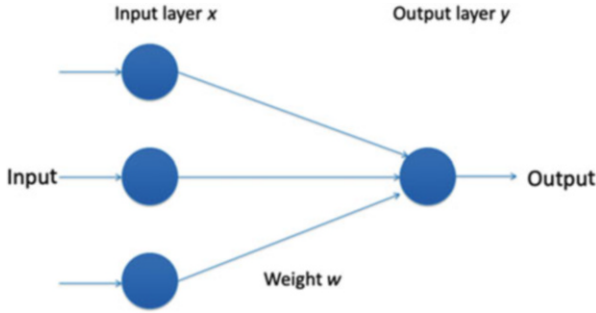
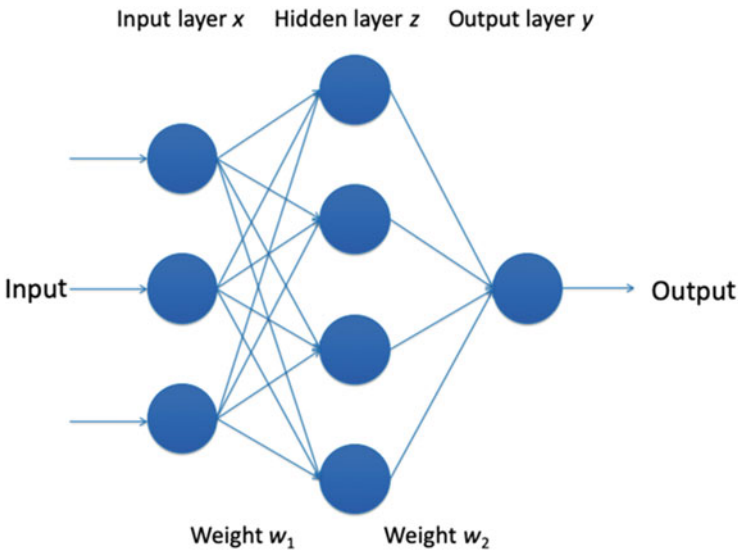Fig. 23.2 The structure of the simple perceptron

Fig. 23.3 The structure of the multilayer perceptron

achieved an accuracy that exceeded that of other teams (Krizhevsky et al. 2012). It has had a huge impact on the image processing and artificial intelligence research communities. The method used in SuperVision is the deep learning developed mainly by Professor Jeffrey Hinton at the University of Toronto.

The major point of deep learning is to enable learning of multilayered (deep) neural networks from tens to hundreds of layers by incorporating a kind of "information compressor" called an autoencoder into the neural network. The autoencoder plays the role of "compressing information," i.e., "extracting only essential features." The epoch-making point of deep learning is that it acquires high learning ability to capture essential features from images by layering the autoencoders.

When using deep learning actually, it is necessary to learn an enormous number of weighting parameters from an enormous amount of data, and a large amount of

computing power is required. The use of GPGPU (General-Purpose computing on Graphics Processing Units) is practically essential.

Deep learning methods are being applied to various fields such as speech recognition, machine translation, robot control, and automated driving, but the most advanced applications and methods are still in the field of image processing.

23.3 Application of Deep Learning to Real Estate Property Photographs

Almost 5 years have passed since the effectiveness of deep learning became widely known and easy-to-use open-source software libraries have been developed. Research and developments that apply deep learning to real estate property photographs are also increasing. This section introduces some recent examples.

23.3.1 Photograph Classification for Quality Improvements of Posted Photographs

As stated in the beginning, quality variation is a major issue in property photographs that are highly valued by users looking for real estate properties. In some cases, photographs that violate the regulations for real estate information are posted. Each company that operates a real estate information site strives to improve information quality through manual checks, etc., but there are limits to manpower in situations where more than millions of photograph data are submitted daily. Since then, efforts are being made to use state-of-the-art image processing technologies such as deep learning.

Kikuta et al. (2016) reported an example of deep learning applied to the task of detecting anomalous photographs that violate regulations at the real estate information site SUUMO. In the task of detecting "photographs with people reflected," a type of convolutional neural network (Convolutional Neural Network, CNN) that is a deep learning method suitable for image processing is used. They reported that the probability of missing an abnormal photograph is less than 5%.

Ishida and Kiyota (2016) used the LIFULL HOME'S data set (described later) to evaluate the accuracy of automatic discrimination by deep learning of 13 types[3] of photographs. It is reported that the error rate of 14.3% was achieved by learning from 130,000 photograph data (10,000 samples randomly selected for each type) using CNN. As shown on the left of Fig. 23.4, although the accuracy is low for classifications such as "living," where the judgment by humans also tends to fluctuate, the

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[3] 13 types of photographs, including floorplan, map, entrance, living room, kitchen, bath, restroom, washbasin, storage, equipment, balcony, entrance hall, and parking.

Fig. 23.4 Classification of property photograph types using deep learning

"kitchen" and "bath" achieve extremely high accuracy. Even in the error example, there are not a few examples that are considered to be classified into multiple types. On the right side of Fig. 23.4, there are subtle examples of errors such as classifying "bathroom washbasin" (the correct answer is "washbasin") as "bath."

As mentioned above, real estate property photograph classification by deep learning has achieved the same level of accuracy as human beings at present, so application examples in the business are being reported. The author's company has been operating a system for detecting inconsistencies in the category of real estate property photographs submitted by real estate companies since December 2016 (LIFULL Co. Ltd. 2016). LIFULL HOME'S has a system that gives priority to displaying properties with more room photographs registered in the search results from the viewpoint of providing more useful information to users. As in the case of photographs, there is a problem that inconsistencies occur such as that photographs other than indoor photographs are registered by indoor type. Therefore, by using deep learning, the consistency rate is automatically calculated as shown in Fig. 23.5, and for the photographs that are inconsistent with the registration type, the registration real estate company is encouraged to correct it.

23.3.2 Photograph Analyses for Promoting Values of Property Information

In response to the diversification of users' needs for finding real estate properties, the real estate information site also supports adding various search conditions such as "counter kitchen," "broadband connection," and "convenience store nearby."

Fig. 23.5 Inconsistency detection of property photograph classification using deep learning

However, since there are so many factors related to the ease of living of the property, the maintenance of the database has not kept up with the diversification of needs.

In response to the diversification of users' needs for finding real estate properties, the real estate information site also supports adding various search conditions such as "counter kitchen," "broadband connection," and "convenience store nearby." However, since there are so many factors related to the ease of living of the property, the maintenance of the database has not kept up with the diversification of needs. Therefore, attempts have been made to improve the value of real estate property information by extracting indices related to comfortability of living from property photographs. Ishida and Kiyota (2016) focused on "comfortability of use of the kitchen," which greatly affects the ease of living and conducts an experiment to distinguish two types of indicators, "Kitchen type" and "Workspace," using deep learning. For the former, create a data set (consisting of 1000 photographs of each type, a total of 5000 photographs) classified into five types: "system kitchen," "simplified system kitchen," "non-system kitchen," "kitchen part," and "others." And by learning with CNN, a high accuracy of 11.6% error rate has been achieved. For the latter, we created a data (categorized into 5500 photographs in Fig. 23.6, consisting of a total of 5500 photographs) that was categorized into 6 types including "very narrow" to "very wide" plus "others." Although the error rate of category discrimination is not so good at 36.2%, it can be seen from the mixing matrix (lower left of Fig. 23.6) that the size can be identified to some extent. When the correlation coefficient is calculated by assigning a breadth score to each category, it is 0.717

very narrow	narrow	normal	wide	very wide
You can't put a cutting board	You can put a cutting board, but you can't put cut ingredients	You can put a cutting board and cut ingredients	You can put multiple ingredients on the cooking process	There is enough space for cooking
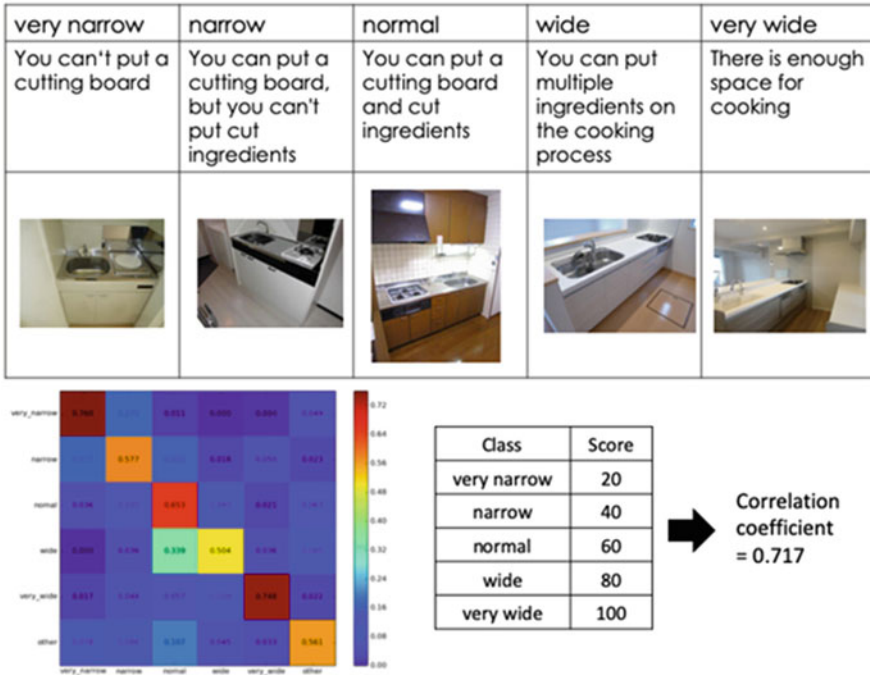
Fig. 23.6 Detection of workspace width of kitchens

(lower right in Fig. 23.6), and it can be expected that practical accuracy will be achieved by expanding the data set.

23.4 Promotion of Open Innovations in the Real Estate Industries Through Provision of Data Sets for Academic Communities

As mentioned above, applications of deep learning to real estate property photographs become active in business situations. However, there is an overwhelming shortage of human resources to implement deep learning in order to further draw out the potential of advanced image processing technologies such as deep learning and create new innovations. In particular, human resources who are familiar with deep learning are rare, and it is not realistic to create innovation with just one company.

Therefore, our company began to activate studies related to real estate by providing a data set including image data such as property photographs and floorplans held by our company for academic research purposes. With the cooperation of the National Institute of Informatics of Japan (NII), we started providing "LIFULL HOME'S Data set" (National Institute of Informatics 2015) (Fig. 23.7) in

Fig. 23.7 LIFULL HOME'S data set

November 2015. The LIFULL HOME'S data set includes information on all properties for rent (approximately 5.33 million) that were listed on LIFULL HOME'S as of September 2015, property photographs (approximately 83 million items) associated with it, and floorplan images (approximately 5.15 million items). It is currently provided to more than 80 university laboratories and research institutions in Japan and overseas. More than 3 years have passed since the launch, and very interesting research is being announced.

I would like to briefly introduce one of the very interesting research cases using the property photographs and floorplan image data included in the LIFULL HOME'S data set. A study group at Simon Fraser University in Canada has shown that it is possible to create new applications by solving the task of correlating floorplans with indoor photographs using deep learning (Liu et al. 2016). Consider the "quiz for selecting the correct bathroom photograph corresponding to the floorplan" as shown in Fig. 23.8 (the correct answer is (A)). This quiz is a very difficult task for humans, and even in an experiment by a crowdsourcing service (Amazon Mechanical Turk) worker, the correct answer rate is only 43%, and it takes 30 seconds or more on average to solve one task. However, by using a deep neural

Fig. 23.8 Which of the four photographs corresponds to the left floorplan?
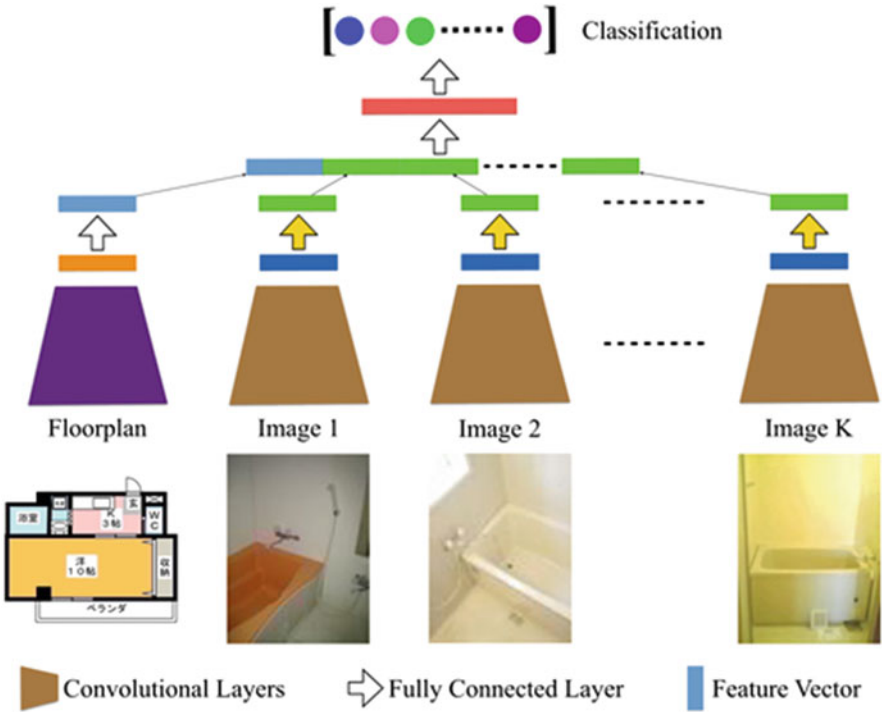

Fig. 23.9 The architecture of the deep neural network for answering the questionnaire in Fig. 23.8

network as shown in Fig. 23.9, a correct answer rate of 72% far exceeding that of human beings has been achieved, and more than 20 problems can be solved in one second.

If the deep neural network learned as described above is used, there is a possibility that the position on the floorplan corresponding to the indoor photograph can be estimated. When the visualization method is used, as shown in Fig. 23.10, it can be seen that the position on the floorplan corresponding to the indoor photograph (center) is correctly pointed by the red spot on the right side of the figure. This result
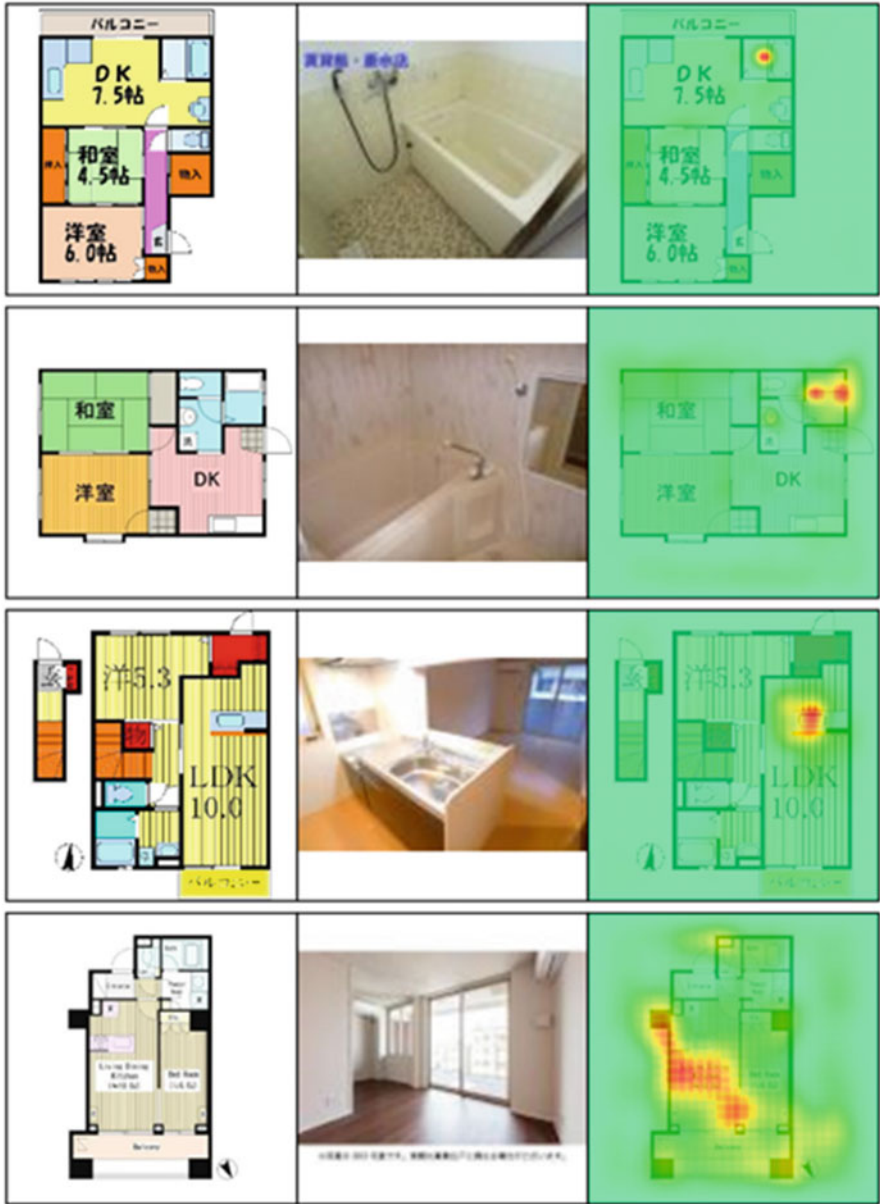
Fig. 23.10 Visualization for the receptive field of the prediction by the neural network

seems to suggest the possibility of realizing new navigation based on floorplans on the real estate information site.

23.5 Conclusion

In this article, we introduced the outline and application examples of image processing technologies, especially deep learning, to further enhance the quality and value of property photographs and floorplans that are very important in real estate property information. Image processing technology is still developing rapidly, and it is expected that even greater innovations will be generated one after another.

On the other hand, researchers and engineers who are familiar with image processing technologies such as deep learning are extremely rare even in the world, and the competition for human resources is not only between companies but also between industrial fields. With research and development in various industrial fields such as advertising, finance, automobiles, and robots, to create new innovations in the real estate field, it is important to develop a mechanism that encourages people familiar with such technologies to engage in the real estate field. In order to attract such people, it is indispensable to present challenging tasks and to develop a data set and research community as infrastructure for research and development. I would like to make further contributions to the creation of such R&D infrastructure in the real estate field.

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