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Analysis of Factors of Residents' Participation in Management of Bus Transportation

Kumiko TANIUCHI
Ph.D student
Graduate School of Engineering
Osaka University
2-1, Yamadaoka, Suita, Osaka 565-0871, Japan
Fax: +81-6-6879-7612
E-mail: taniuchi@civil.eng.osaka-u.ac.jp

Hiroto INOI
Research Associate
Graduate School of Engineering
Osaka University
2-1, Yamadaoka, Suita, Osaka 565-0871, Japan
Fax: +81-6-6879-7612
E-mail: inoi@civil.eng.osaka-u.ac.jp

Yasutsugu NITTA
Professor
Graduate School of Engineering
Osaka University
2-1, Yamadaoka, Suita, Osaka 565-0871, Japan
Fax: +81-6-6879-7612
E-mail: nitta@civil.eng.osaka-u.ac.jp

Abstract: In Japan, bus transportation with resident participation increases in areas where conventional bus services are not provided. Resident participation is based upon social capital, which consists of companionship, participation, trust and reciprocity. However there have been no studies about relation between bus services with resident' participation and using social capital. This research attempts to clarify factors that influence attitude of residents to participation in bus transportation using the "social capital" concept. Questionnaire-based research is conducted in an area where bus service with resident participation is under planning. This research focuses on securing funds and supplying the bus in management of bus transportation service. Our analysis indicates that social capital affected to burden charge for the bus from all residents and willingness to participate as volunteer driver.

Key Words: *resident participation, bus transportation, social capital, attitude survey*

1. INTRODUCTION

The elderly population ratio in Japan has been increasing quickly in recent years, and is 21.9% as of 2009 [Population Statistics of Japan 2009]. With becoming an aged society, the number of elderly people who cannot drive a car increases. Land is becoming suburbanized in usage due to the influence of motorization, and public transportation services have become inconvenient. Realizing the idea of normalization requires ensuring public transportation services for all people.

Many local governments provide bus transportation services. However, those buses may have few users and may cost public immense amounts of money. This is because the bus service does not meet residents’ needs, and residents do not recognize the bus as "our necessary bus".

On the other hand, bus transportation services with resident participation have been increasing gradually. By such resident participation, the bus service can meet residents' needs, and residents can recognize it as "our necessary bus". Bus services can therefore be maintained, even in areas where commercial bus services cannot be provided. Resident participation in management of bus transportation services can complement market failure. However, speed of expansion of the bus transportation with residents' participation is slow compared with the speed of expansion of area without public transportation services.

Factors required to induce residents to participate in bus management are not clear. From a qualitative standpoint, it is said that the relation between residents is strong in areas where residents participate in management of bus transportation [Inoi (2004)]. The relation which local residents share can be regarded as "social capital." Social capital refers to features of social organization such as networks, norms and social trust that facilitate coordination and cooperation for mutual benefit [Putnam (2000)]. In areas with rich social capital, where residents have strong relationships and share common perceptions on issues within that area, they can deal collectively with those issues. Although it believed that the relevance of social capital and city planning are strong, little quantitative research has been conducted from such a viewpoint. Kawakami analyzes relation of regional planning organization and social capital [Kawakami (2005)]. Shibaike and others analyze social capital formation factors based on residents' survey [Shibaike (2006)]. Suzuki analyzes that people's daily encounters with environment and neighbors affect their attachment toward their living areas [Suzuki (2008)].These researches considered relevance of social capital and general city planning activities, and analysis of residents participating in public services is not conducted.

This research attempts to clarify factors that influence attitude of residents towards participation in management of bus transportation services, using "social capital" concept. This research focuses on securing funds and supplying the bus in management of bus transportation service. Therefore, we analyze factors of attitude to burden charge for the bus from all residents regardless of use. And we analyze what kind of people those who are willing to participate as volunteer driver.

2. MEANING OF RESIDENT PARTICIPATION IN BUS TRANSPORTATION, AND WAY TO PARTICIPATE

2.1 MEANING OF RESIDENT PARTICIPATION IN BUS TRANSPORTATION

Bus transportation services in Japan have largely been conducted as commercial business. The service providers do everything from planning to running the buses, and residents only utilize the services without participating in management of the transportation. However, in recent years, bus enterprise is not realized as a commercial business activity, but is performed through public sector involvement by country or local governments. In order to maintain the

deficit-ridden-bus services, the public sector subsidizes the provider. Recently many local governments provide "community buses." Even when they seek resident participation, it is restricted and passive, for example, conducting attitude surveys or providing information brochures.

On the other hand, bus transportation with active resident participation in management also exists. Kato defines public bus transportation organized and funded by residents or companies of an area as "Upward Process Management Scheme" [Kato (2003)]. In Europe and America, bus transportation supplied by local resident organizations is called “Community Transport”, and becoming widespread. When residents participate in bus management, bus transportation can be provided even in areas with low demand and weak financial base. Bus transportation with resident participation is supported by voluntary activities of residents thus overcoming shortage in financial resources.

2.2 WAY OF RESIDENT PARTICIPATION IN BUS TRANSPORTATION

To provide the bus service, it is necessary to take four steps: planning, securing funds, supplying bus, and evaluation and improvement. It is also important that residents participate actively in each step. In particular, their participation in securing funds and supplying the bus is more important for actualizing the bus transportation.

There are various methods for securing funds, such as collection of support money from entrepreneurs such as hospitals and commercial companies. This study considers the way in which resident organization collects burden charges for the bus from all residents regardless of use. The burden charges make it possible to maintain bus transportation even when there are few users. As the way for residents to participate in supplying buses, this research considers several residents driving a bus by taking turns as volunteers. Such volunteer drivers make it possible to maintain bus services even with poor funding and when there is no bus provider.

Table 1 Process of bus transportation

Planning	Designing contents of bus service. Route, bus stop, fares, operational hour, etc.
Securing funds	Securing funds for providing service.
Supplying bus	Supplying bus transportation according to plan.
Evaluation and Improvement	Evaluation of whether service is cost effective and meets user needs. Improvement based on evaluation.

Table 2 Way of resident participation in bus transportation in this study

Securing funds	Collecting Burden charge from all households irrespective of service usage
Supplying bus	Several residents driving a bus by taking turns as volunteers

2.3 ASSUMPTION OF RESIDENTS' ATTITUDE TOWARDS PARTICIPATION IN MANAGEMENT OF BUS TRANSPORTATION

It is assumed that social capital affects on attitude of participation in securing funds and supplying bus. Social capital consists of "trust", "norm", "network", etc. People who are trustful and have helping norms can help one another when they have no mobility issues. And, those who have a network of association with neighbors in the community understand the situation of people who do have mobility issues. Therefore, people with high social capital are more likely to agree to bus transportation with resident participation.

It is assumed that level of restriction of mobility affects attitude towards burden charge for the bus service. Those who have issues with mobility are likely to be willing to pay burden charge for the service. Such issues include inability to drive a car, to walk long distances, and ask the family for driving them, in areas where public transport is inconvenient. And, it is assumed that occupation and age affect willingness to participate as volunteer drivers. Occupation affects the time for which the volunteer can serve, and age affects confidence of safe driving.

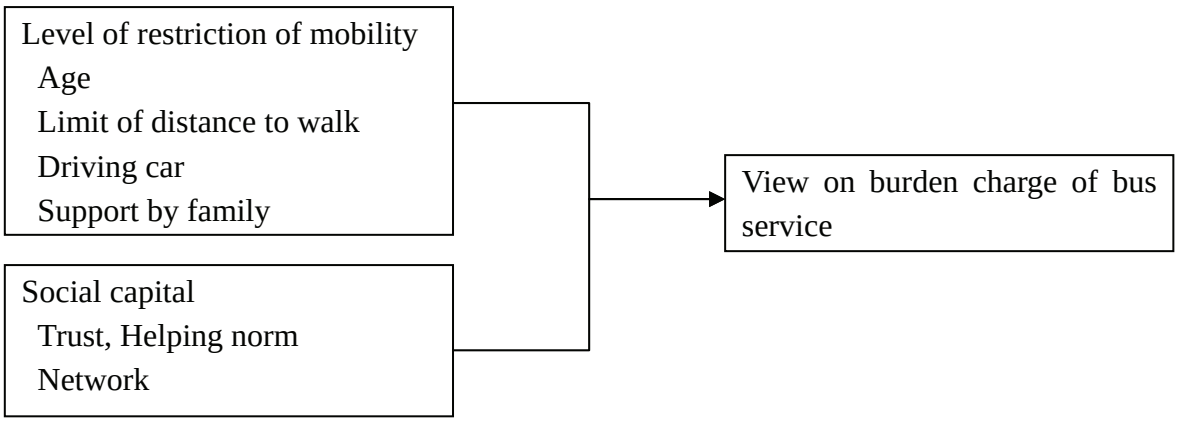


Figure 1 Factor of View on Burden Charge for Bus Service

3. AN OVERVIEW OF CASE STUDY AND DATA

3.1 AN OVERVIEW OF CASE STUDY

A case study is carried out in a rural community called Doi area of Mimasaka city in Okayama prefecture, Japan. Doi area is located on a mountain slope, and has no hospitals or

stores. Therefore, residents seeking a hospital or a store need to go out to central business district, in order to go to hospital, shop, etc. It is necessary to change a bus and a train, in order to go to CBD. Since there is one bus line in the area and intervals of bus stops are large, almost all residences are distant from the bus stops. And the bus frequency is only 3 rounds per a day.

Public transport is inconvenient in this area, and also in Mimasaka city. There are 11 areas in Mimasaka city. In two areas including Doi area, frequency of bus service is 3 or less rounds per a day. The local government is examining a new traffic system and asking residents for their cooperation with this system.

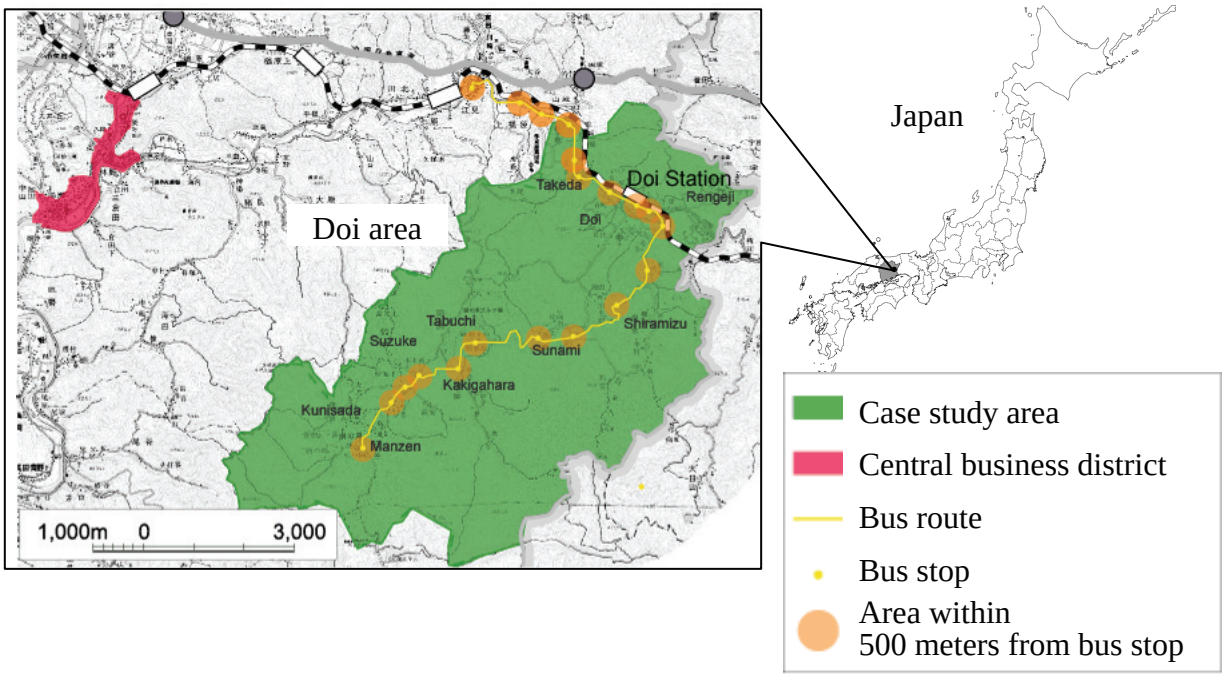


Figure 2 Geographical Features of Doi Area

Table 3 Situation in Doi Area

Population	2,325
Population of elderly people (Rate)	886 (38.1%)
Level of bus service	Frequency: 3 rounds per day Fare: 30 to 360 yen

3.2 OVERVIEW OF THE SURVEY

The questionnaire survey is summarized in Table 4. We distributed 1,826 sets of the forms and collected back 822 sets at a collection rate of 45%. The questionnaire forms were both distributed and collected back by mail.

Table 4 Survey overview

Date of survey	July 2008
Number distributed	1,826
Number collected back	822
Collection rate	45.0%
Sampling rate	35.4%
Method of distribution and collection	By mail
Question Items	Individual property usual movement situation Opinion on bus Social capital index

Table 5 Respondent Demographics

Age	Less than 45years old: 95 (11.5%) 65-74years old: 215 (26.0%)	45-64 years old: 229 (27.8%) 75 years and over: 285 (34.6%)
Gender	Male: 364 (45.8%)	Female: 431 (54.2%)
Ability to drive car	Can drive: 499 (60.9%)	Cannot drive: 320(39.1%)
Private car ownership	Owner: 670 (81.8%)	Non-owner: 149(18.2%)

3.3 MEASUREMENT OF SOCIAL CAPITAL

In this research, the items shown in Table 6 are selected as measurement items of social capital, referring to the previous study by Putnam, Uphoff, World Bank, Cabinet Office of Japan. Uphoff proposes that social capital be divided into two categories, "structural social capital" and "cognitive social capital". Structural social capital is connected with network and social organization, and while cognitive social capital is connected with mental state and attitude. These two categories of social capital are highly interdependent, each form contributing to the other.

We created two indexes of structural social capital and cognitive social capital from the measurement items. First, each measurement item is normalized so that average may be set to 0 and distribution to 1. Next, the mean of each index is used as a central value. A large index implies that social capital is high. The Cronbach's alpha, which is a numerical coefficient of reliability, is measured. The alpha for structural social capital is found to be 0.52, and for cognitive social capital, 0.63.

Table 6 Composition item of Social capital

	Structural	Cognitive
Sources and manifestation	Networks Other interpersonal relationships	Norms Beliefs
Domains	Social organization	Civic culture
Questions in this study	How well do you get along with your neighbors? Do you care about the health of your neighbors?	Do you trust people in general? Do you think you should help someone who has helped you before? Do you think you should help people troubled? Do you think that residents should solve troubles in community?
Cronbach's alpha	0.517	0.634

4. RESIDENT'S ATTITUDE OF PARTICIPATION TO MANAGEMENT OF BUS TRANSPORTATION AND FACTOR ANALYSIS

4.1 VIEW ON IMPROVEMENT OF BUS SERVICE

Figure 3 shows the view on improvement of bus service. Figure 4 shows the reasons for improving bus service. About calculation of reason for improving bus service, we use only the data of samples that answer "Improvement of bus service is necessary."

A little less than 82% of the respondents answer that bus service needs to be improved. Since the bus service level offered in the Doi area is low, residents recognize the need for improvement. Regarding reason for improving bus service, more people who answer "helpful for community" than "helpful for myself or family".

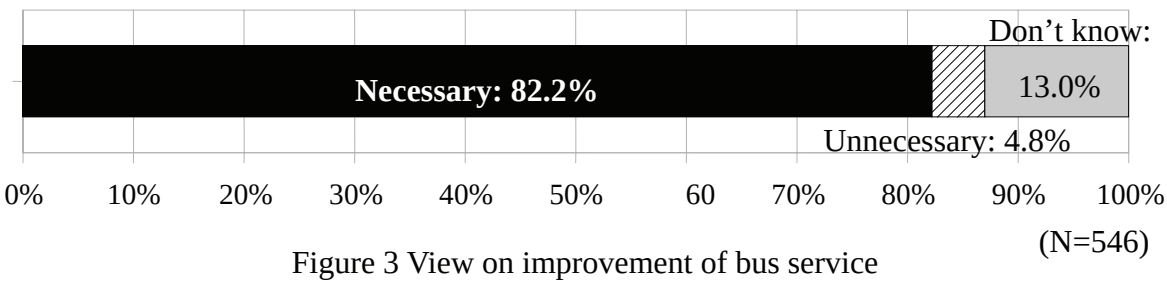


Figure 3 View on improvement of bus service

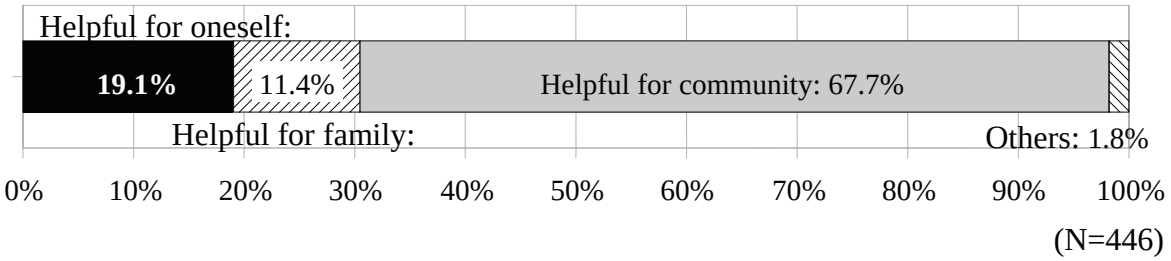


Figure 4 Reason for improving bus service

4.2 ATTITUDE TOWARDS PARTICIPATION IN MANAGEMENT OF BUS TRANSPORTATION

Figure 5 shows the view on burden charge for bus service. Figure 6 is about willingness to participate as volunteer driver. In calculating this willingness, we have considered only those able to drive a car.

23% of the respondents answer "agree" to collecting burden charge from all the households irrespective of bus service usage. 46% of those who can drive answer "Willing to participate" as an operation volunteer. Although many people recognize that the bus service needs to be improved, not many agree to paying a burden charge for the service. On the other hand, there are many candidates for the volunteer driver of bus transportation in the community.

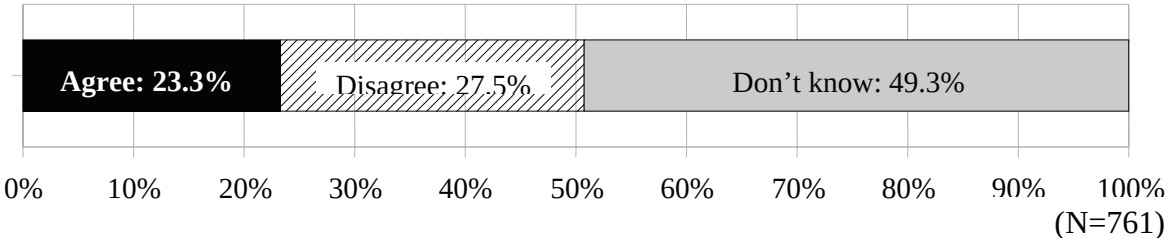


Figure 5 View on burden charge for bus service

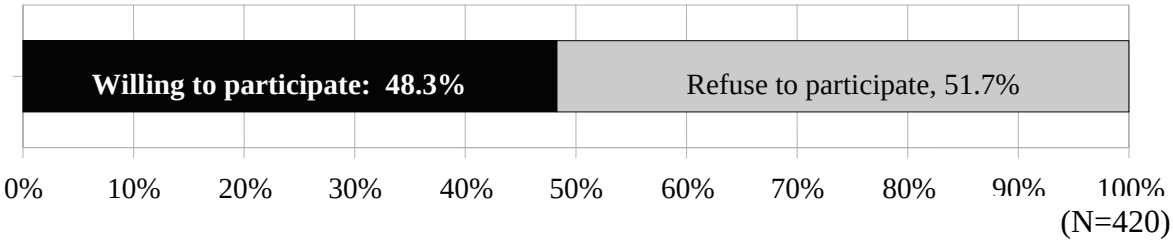


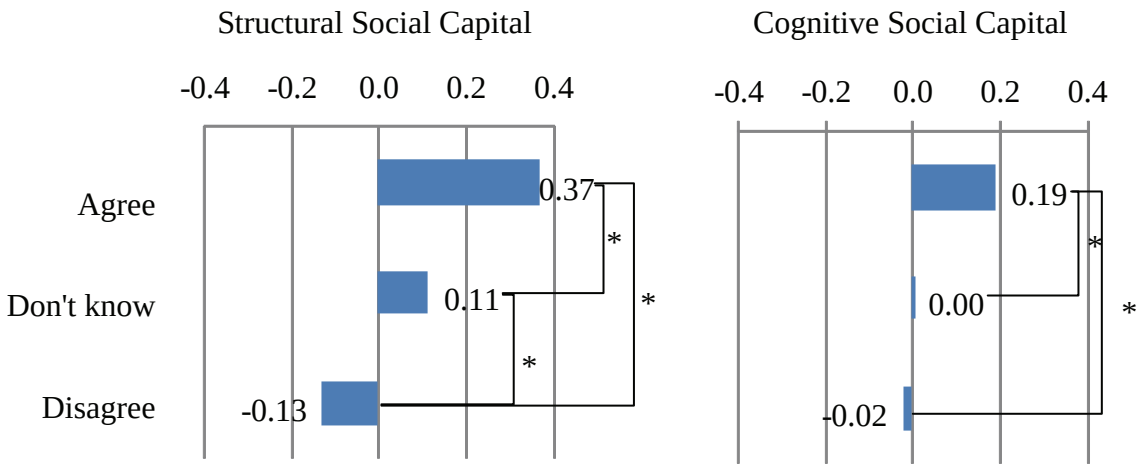
Figure 6 Willingness to participate as volunteer driver

4.3 RESIDENT’S ATTITUDE TOWARDS PARTICIPATION IN MANAGEMENT OF BUS TRANSPORTATION AND SOCIAL CAPITAL

Figure 7 shows the average value of social capital for each opinion about burden charge for

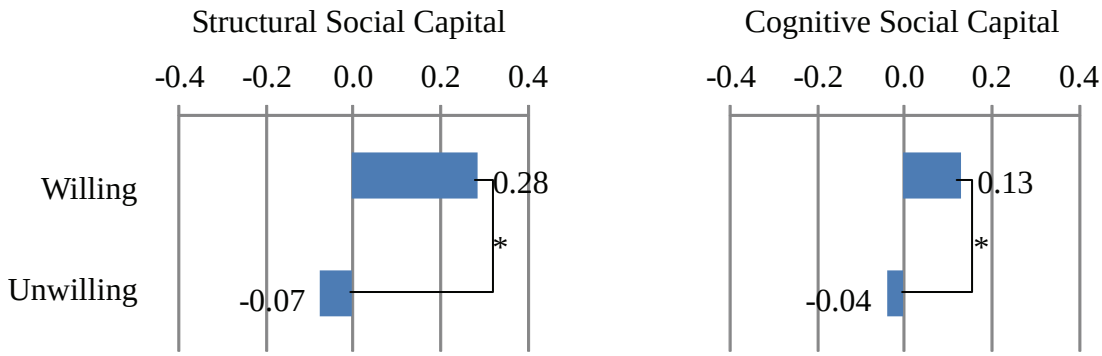
bus service. Those who answer "agree" have higher values of both structural and cognitive social capitals than those who answer "disagree" or "I don't know." Those who agree to the burden charge associate with neighbors actively, and also have strong sense of trust in people and a helping norm.

Figure 8 shows the average value of social capital for each opinion about participation as volunteer driver and social capital. Those who answer "willing to participate" also have higher values of structural and cognitive social capitals than those who answer "unwilling to participate".



* level of significance p<5%

Figure 7 View on burden charge of bus service and social capital



* level of significance p<5%

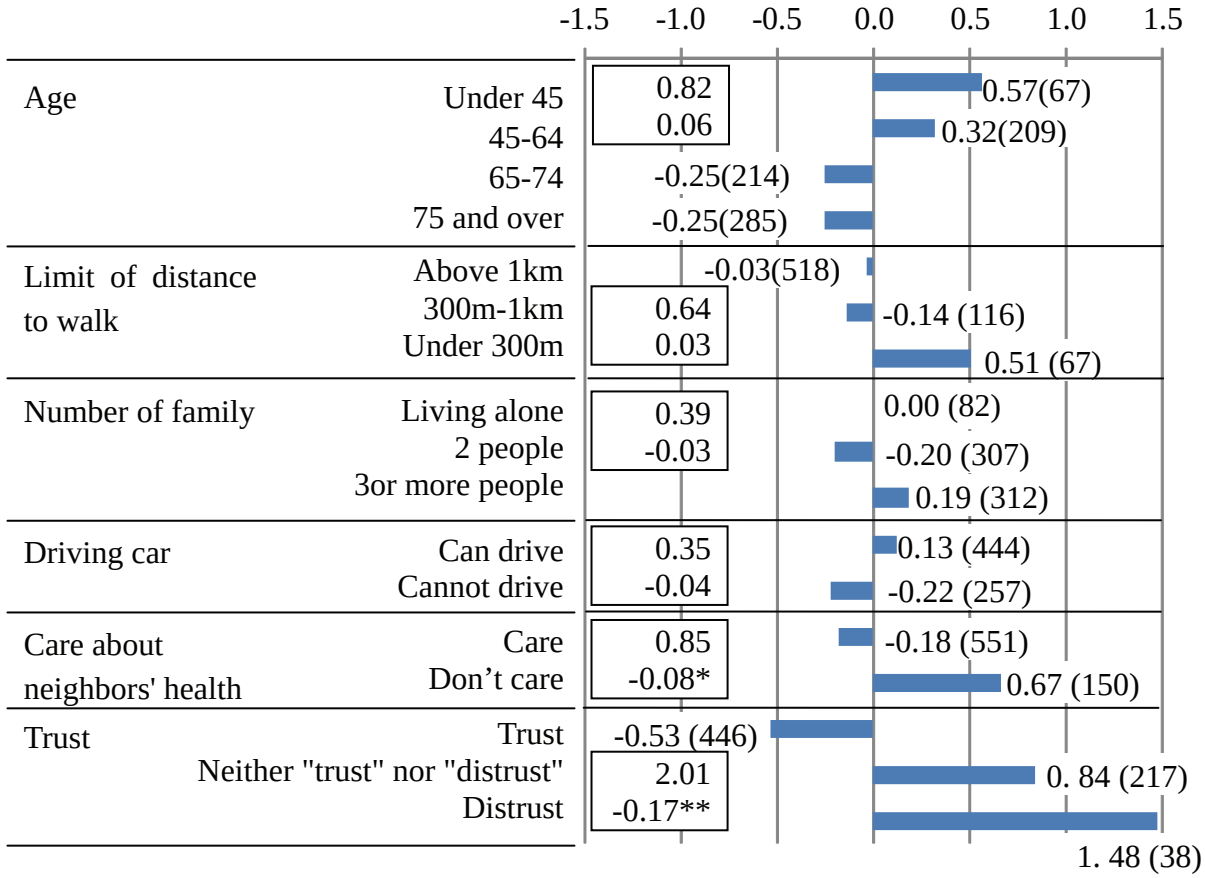
Figure 8 Willingness to participate as volunteer driver and social capital

4.4 FACTOR ANALYSIS OF RESIDENTS' ATTITUDE TOWARDS PARTICIPATION IN MANAGEMENT OF BUS

We analyze factors of attitude to burden charge for bus service using Hayashi's quantification method type 2. An external criterion is the view on burden charge for bus service. Explaining variables are an individual attribute and social capital. View on burden charge for bus service

is classified into two: "agree" and "disagree or don't know." Individual attributes are "age", "limit of distance to walk", "driving car" and "number of family." The first three, "Age", "limit of distance to walk", and "driving car", mean individual movement capability. "Number of family" means the situation that can be supported by the family. Items that do not have multicollinearity with individual attribute are chosen as representation indexes of social capital. "Care about neighbors' health" is chosen as a representation index of structural social capital, and "trust" is chosen as a cognitive social capital. Figure 9 shows the analysis result.

The largest influence on the view on burden charge is from "trust" showing cognitive social capital. "Care about neighbors' health" showing structural social capital has smaller influence than "trust". Those who care about neighbors' health are likely to agree to burden charge for bus service. About individual attributes, "age" and "limit of distance to walk" affect the view on burden charge for bus service. People aged 65 or over are likely to agree to this burden charge. About "limit of distance to walk", those who can walk "about 300m - 1km" are likely to agree to burden charges. "Driving car" has smaller influence on the view on burden charge than other items.



Category score (number of samples)

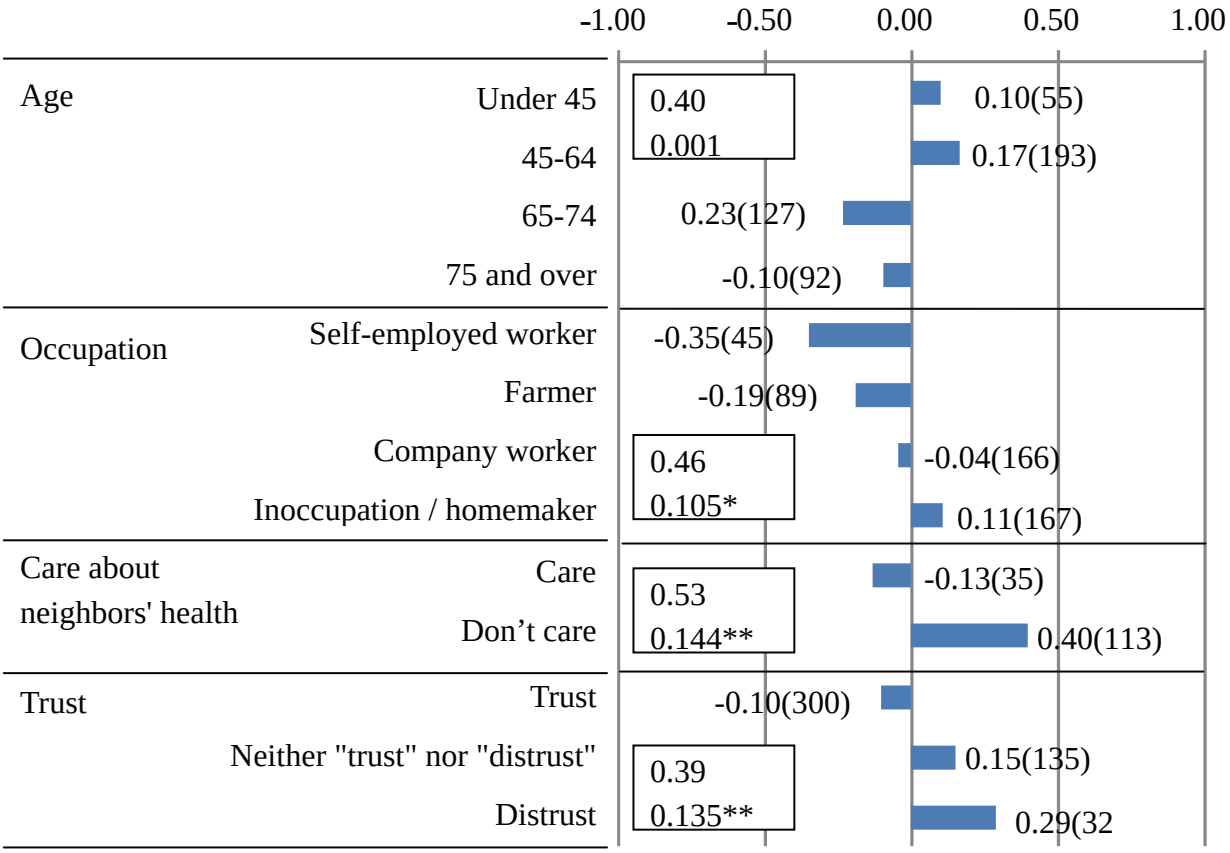
Range
Partial correlation coefficient
* p<5%, ** p<1%

Number of samples 713; Correlation ratio 0.22		
Center of gravity	Agree	Don't know / Disagree
	-0.16	0.30

Figure 9 Factor Analysis of view on burden charge for bus service

Secondly, we analyze factors of willingness to participate as volunteer driver using Hayashi's quantification method type 2. An external criterion is the willingness to participate as volunteer driver. Explaining variables are an individual attribute and social capital. Individual attributes are "age", "occupation". Figure 10 shows the analysis result.

The largest influence on the willingness to participate as volunteer driver is from "Care about neighbors' health." "Trust" also affect on the willingness to participate. Those who care about neighbors' health and trust people in general are likely to be willing to participate as volunteer driver. About the individual attribute, people of the occupation which have some flexibility about time, such as self-employed worker and farmer, are likely to be willing to participate. People aged under 65 are likely to be unwilling to participate, but people 65 and over are likely to be willing to do.



Category score (number of samples)

Range
Partial correlation coefficient
* p<5%, ** p<1%

Number of samples 467; Correlation ratio 0.27		
Center of gravity	Willing -0.28	Unwilling 0.27

Figure 10 Factor analysis of willingness to participate as volunteer driver

4.5 NEED OF LEVEL OF BUS SERVICE AND RESIDENT'S ATTITUDE TOWARDS PARTICIPATION

Table7 shows a cross tabulation result of need for frequency of bus, and view on burden charge for bus service. Table8 shows a cross tabulation result of need for frequency of bus, and view on burden charge for bus service. In calculating this need, we have considered only those want to take a bus.

There are many people who have needs of few frequencies in those who agree to burden charge for bus service. Those who disagree to burden charge for bus service have needs of a high level. On the other hand, there was not seen relation between need for frequency of bus and willingness to participate as volunteer driver.

Table 7 Need for frequency of bus, and view on burden charge for bus service

Number of samples 509		Needs for bus frequency per a day					
		1round	2-3 rounds	4-5 rounds	5-6 rounds	7-8 rounds	Total
View on burden charge for bus service	Agree	11	85	44	6	21	167
		6.6%	50.9%	26.3%	3.6%	12.6%	100.0%
	Disagree	3	52	62	9	31	157
		1.9%	33.1%	39.5%	5.7%	19.7%	100.0%
	Don't know	7	126	105	20	50	308
		2.3%	40.9%	34.1%	6.5%	16.2%	100.0%

Chi-square testing: p=0.5% < 1%

Table 8 Need for frequency of bus, and view on burden charge for bus service

Number of samples 342		Needs for bus frequency per a day					
		1round	2-3 rounds	4-5 rounds	5-6 rounds	7-8 rounds	Total
Willingness to participate as volunteer driver	Willing	1	74	61	8	31	175
		0.6%	42.3%	34.9%	4.6%	17.7%	100.0%
	Unwilling	6	57	58	14	32	167
		3.6%	34.1%	34.7%	8.4%	19.2%	100.0%

Chi-square testing: p=12.9%

5. CONCLUSION

In this research, we used the "social capital" concept to analyze factors that influence attitude of residents towards participation in management of bus transportation.

We analyzed factors of attitude to burden charge for the bus from all residents regardless of use. It became clear that social capital affects attitude to burden charge for bus service. The influence of cognitive social capital was especially large.

About individual attributes, people with mobility issues are likely to agree on paying burden charge for bus service. These are the elderly and people living alone. It also becomes clear that driving ability has only a slight influence on the attitude of paying burden charge for bus service. If there is widespread trust and active association with neighbors in the community, it is possible to supply a bus service with resident participation in management even if the area is automobile-dependent.

We analyzed willingness to participate as volunteer driver. It became clear that social capital affects willingness to participate as volunteer driver. And people of the occupation which have some flexibility about time, such as self-employed worker and farmer, are likely to be willing to participate.

In this research, we analyzed one area where bus transportation by resident participation is in the planning stage. As topics for the further study, it is necessary to conduct investigation in certain areas, such as those where bus services are already being provided through resident participation, and to determine in detail the features of those areas.

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