One-Person Households and Public Assistance

in Japanese Elderly:An Analysis Using Prefectural Data

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An Analysis Using Prefectural Data

Abstract

This study explores the effects of regional differences in elderly one-person households on regional differences in the public assistance rate for the elderly using data by prefecture. We show that a positive correlation between elderly single-male households and the public assistance rate for the elderly exists even when prefectural fixed effects are considered. However, no significant effect was found between elderly single-female households and the public assistance rate. We also confirmed that there a significantly positive relationship between these variables after 2000 or in large cities exist, while no effect was found before 1995 or in rural areas. From these results, since the late 1990s, elderly one-person households are increasing due to further urbanization in Japanese society, cohabitation is decreasing, and family ties are weakening for risk sharing. This suggests that the increase in elderly one-person households may be directly linked to the public assistance rate for the elderly.

Key words: Elderly one-person households, Public Assistance, Gender Difference

JEL code: I30 J12

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1. Introduction

Japanese society is aging rapidly and is now the fastest aging country in the world. Population aging is also expected to continue increasing in the future. **Table 1** demonstrates that the aging rate was 26.5% for Japan in 2019, while it will reach 38.1% for Japan in 2060.

In contrast, poverty is another problem of Japanese society, along with aging. The Japanese regarded Japan as an equal society that it was "100 million total middle class" as it in the 1980s. For its people to focus on poverty in the 1980s was rare. However, the issue of income distribution began to reappear after the collapse of the bubble economy in the 1990s. In the 2000s, although poverty became a critical issue in Japan, the problem was not resolved. As **Figure 1** shows, the relative poverty rate in Japan is one of the highest among developed countries. Considering this, the number of households receiving public assistance started increasing since the latter part of the 1990s. **Figure 2** presents the trend of households receiving public assistance. Although the number of households receiving public assistance was stable at around 600,000 until the middle of the 1990s, the number started increasing rapidly since then, and it exceeded 1.6 million in 2015. The number of elderly households receiving public assistance is 800,000, which accounts for half of the total.

Since the 1990s, aging and poverty have become major problems in Japan. Therefore, in this study, we explore the relationship between aging and poverty, which is a major issue in Japan, by focusing on elderly one-person households. In a study that examined the relationship between elderly one-person households and the poverty problem, Tachibanaki and Urakawa (2006) used individual data to measure the percentage of people below the poverty line based on livelihood protection standards. Thus, they

demonstrated that one out of every four elderly one-person households lives below minimum living standards.

Thus, previous studies have shown that elderly one-person households and poverty are closely related. However, on elderly one-person households and public assistance, many previous studies have examined individual data, and only a few studies have focused on gender differences using prefecture-level data. Therefore, in this study, we analyze the effect of prefectural differences in elderly one-person households on prefectural differences in the public assistance rate for the elderly, focusing on gender differences. As a result of the analysis, we confirm a correlation between prefectural differences in elderly single-male households and those in the public assistance rate for the elderly, even while considering prefectural fixed effects. No significant relationship exists between elderly single-female households and public assistance for the elderly. Moreover, while single-male households have significant effects on public assistance for the elderly after 2000 and in city areas, no relation exists between them before 1995 and in rural areas.

Beck (1986) states that the perseverance of modernization freed females from the traditional division of sexual roles and effected the personalization of the family structure. This dramatically increased the number of one-person households and single mothers. In addition to the decrease in living together due to further urbanization around the late 1990s in Japan, the function of risk sharing by families has weakened. This suggests that the increase in elderly one-person households may have been directly linked to the public assistance rate for the elderly[1].

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[1] One of the evidences family structure has changed in 1990s is that nursing care insurance system was implemented in 2000. The system intends to share the burden with the whole in the country, instead of each family.

Aging populations are present not only in Japan but all over the world. As Beck (1986) highlights, changes in family structure due to urbanization and personalization are observed in many countries transitioning from traditional to modern societies. Therefore, our study is useful examining the future of countries around the world, especially Asian countries, which have changed from traditional to modern societies and have become more urbanized and personalized.

2. The current and future situation of elderly single households

In this section, we explain the present condition of elderly one-person households in Japan. Figures 3–1 and 3–2 show the trend of one-person households by age. In the 1980s, the percentage of elderly single-male households was 4%–5%. Although it was slightly lower for 65 to 69 years and 70 to 74 years old, there was no large difference for each age group. Since then, it has risen sharply in all age groups, although the growth in the 65–69 age group is particularly remarkable. As a result, the 65–69 age group was the highest at 15%, and 85 years old and over was the second highest at 13.3% in 2015.

In contrast, the percentage of elderly single-female households aged 85 and over was the lowest (at 5.4% in the 1980s). After that, the 65–69 and the 70–74 age groups have hardly increased since 2000, but other generations have an upward trend. In particular, the growth of people aged 85 and over was remarkable and reached 21.8% in 2015. In 1980, no difference was found comparing the number of males and females over the age of 85, but females were significantly higher in other age groups. In 2015, almost no difference was found between the ages of 65 and 69 years; however, it was significantly higher in females in other age groups.

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Figure 4 presents the forecast of one-person households by the National Institute of Population and Social Security Research. This indicates that in 2005, the rate of elderly one-person households was 19% and 9.6% for females and men, respectively, which was almost double the difference. The rate of one-person households increases slightly for elderly females. In contrast, the rate of elderly single-male households is predicted to rise sharply. As a result, the difference will narrow to 20.9% for females and 17.8% for males in 2030. Inagaki (2013) simulates the trend of the rate of multiple-person households and low income, and insist that the number of unmarried and divorced elderly females with low pensions is expected to increase.

Furthermore, **Figure 5** shows the prefectural differences in the rate of the elderly one-person households by gender. It increased in all regions from 1980 to 2015. Focusing on prefectural differences, Western Japan tends to be higher than eastern Japan. While the rate is higher in metropolitan areas such as Tokyo and Osaka, it is also high in some rural areas such as Kagoshima, Kochi, and Wakayama prefectures in 1980 and 2015.

3. Literature Review

Marchand and Smeeding (2016) surveyed previous studies focusing on the relationship between ageing and poverty. This article shows that the relationship of poverty rate over age distribution is U-shaped both in the US and OECD countries. In addition, the right-hand side of the U-shaped, which indicates the poverty rate for the elderly, has shifted downward. This means that the poverty rate among the elderly has decreased. They also point out *the feminization of poverty* that poverty among females has steadily increased relative to males.

Several studies in Japan have focused on prefectural differences in aging and public assistance (Ushizawa and Suzuki, 2004; Suzuki and Zhou, 2007; Sekine, 2007; Sekine, 2009; Hayashi, 2012; Suzuki and Tanabe, 2018). Ushizawa and Suzuki (2004) found that the aging, unemployment, and divorce rates have a strong effect on the public assistance rate using prefectural data. Sekine (2007) defined elderly one-person households as the percentage of one-person households aged 65 and above divided by the households with relatives aged 65 and above (one-person household with aged 65 and above/households with relatives aged 65 and above), and shows that it has a significant effect on public assistance rate. Sekine (2009) demonstrated that elderly one-person households tend to be households receiving public assistance in metropolitan areas. Suzuki and Zhou (2007) estimated using prefecture-level longitudinal data and indicated that the financial capability index of the local governments and minimum wage both impose negative effects on the public assistance rate, and the aging rate has a positive effect on it. Hayashi (2012) found that the rate of elderly one-person households had a positive effect on public assistance rates using municipal data. Seki (2012) demonstrated that the rate of elderly one-person households has a significant effect on public assistance rate using government-ordinance-designated city' data between 2002 and 2008. Suzuki and Tanabe (2018) predicted the poverty rate after nonlinear multiple regression analysis of the determinants of single elderly households.

In addition, although not focused on elderly one-person households, Abe and Tamada (2007) examined the relationship between the relative level of public assistance over low-wage income and the employment of junior high school graduate men. They show that a relationship exists between regional differences in the ratio of part-time wages to the amount of public assistance and those of the employment rate in junior high school

graduate men. Furthermore, Yugami et al. (2017) analyzed the impact of changes in the level of public assistance on individual employment by using an exogenous shock in which the changes in these standards were caused by the merger of cities, towns, and villages as a natural experiment.

In contrast, many studies focusing on the determinants of the poverty rate or the probability of receiving public assistance for elder single persons used individual data. Tachibanaki and Urakawa (2006) analyzed the determinants of disposable income below the standard of public assistance and showed that the marginal effect of elderly one-person households on public assistance increased to 0.109 in 1995 and 0.205 in 2001. Abe (2008) found that the poverty rate of the elderly is high, and it is even higher in one-person households. In particular, the poverty rate of elderly single-female households is 51.7%, which is more than half. In addition, Inagaki (2013) used a microsimulation model to predict the future of elderly one-person households and the poverty rate. The results show that the poverty rate of the elderly will rise rapidly until 2040. Yamada and Shikata (2016) demonstrated a decrease in the poverty among elderly one-person households was offset by an increased share of this households. Since they are unlikely to receive any help by surroundings, they rely on public assistance. Therefore, the beneficiary rate of public assistance increased regardless of the decrease in poverty rate among elderly one-person households.

In addition, many studies in sociology and demography focused on elderly single households. Klinenberg (2012) described the positive aspect of living alone, criticizing traditional views that emphasize the negative aspects of living alone. In Japan, Ueno (2007) focused on the positive aspects of elderly one-person households. Ishida (2018) analyzed the determinants of isolation and demonstrates the tendency of people with low

socioeconomic status to become isolated.

Previous studies have explored the impact on the subjective well-being of elderly single households (Raymo et al., 2008; Oshio, 2012). Raymo et al. (2008) found the effects of mating and living patterns on subjective health and well-being in Japan over the age of 60. As a result, marriage increases subjective health and well-being in males, but these effects cannot be confirmed in females. Raymo et al. (2008) analyzed the effects of marital status and living patterns on subjective well-being in Japan over the age of 60. As a result, marriage increases subjective well-being in males, but such effects cannot be confirmed in females. Oshio (2012) also focused on gender differences in marital status on subjective well-being by dividing the sample into males and females for the elderly and shows that in males, having a spouse significantly increases life satisfaction, but in females, having a spouse does not have the effect of significantly increasing satisfaction. Furthermore, Ishikawa (1999) analyzed the mortality rate by marital relationship using a life table and found that spouses have a longer life expectancy than unmarried individuals (including those who never married and those widowed and divorced), especially in males. He states that the reason for this is the physical and mental stability of the marriage, such as eating habits and maintaining good health[2].

4. Data, Hypothesis, and Method

This study explores the effects of prefectural differences of elderly single households on the public assistance rate for the elderly. Although previous studies have used individual data, only a few studies have examined gender differences of elderly single

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[2] For females, the difference between married (married, divorced, bereavement) and unmarried is large, not the difference between married and unmarried. However, recently, the divergence between unmarried and married mortality rates is narrowing.

household on the public assistance rate for the elderly using prefecture-level data. In addition, we will examine whether differences exist by areas and periods. Specifically, we estimate the following model.

$$Y_{it} = a + \beta_m Alone\_male_{it} + \beta_f Alone\_female_{it} + \gamma X_{it} + c_i + u_{it}$$

Y_{it} is the public assistance rate for the elderly, *Alone* indicates the rate of elderly one-person households for each gender. The coefficient β indicates the effect of the elderly one-person households on the public assistance rate for the elderly, which we focus on the most. X_{it} is a vector of independent variables, and c_i is an unobserved time-constant variable. To control for an unobserved effect, we use a fixed effect model with clustered robust standard error. We use independent variables such as age structure, life expectancy at age 65, prefectural income per capita, the labor force among the elderly, the unemployment rate, the owned-house ratio, and the financial capability index. In addition, we divide the sample by period and area to consider the effect of urbanization and personalization.

We can deal with endogeneity caused by prefectural individual effects using a fixed effect. However, we must also consider the endogeneity caused by inverse causality because single elderly people might move to the prefectures where public assistance is well developed. Thus, whether the rate of elderly single households is exogenous is unclear. However, these are not plausible for the following reasons. First, although the level of public assistance differs by prefecture, the national government is decided by a general standard considering lifestyle and living standards in areas. There is little room for prefectures to arbitrarily decide the level of public assistance. Second, as the central government owes 75% of the expenditure for public assistance, the prefecture has little

incentive to lower the expenditure. Third, considering the supplementary principle of livelihood protection, rather than making one-person households move to other areas in anticipation of support from livelihood protection, they are classified as one-person households because of exogenous factors such as bereavement of a spouse and individual income. Thus, the cause of relying on public assistance when there is no support from people, assets, family, or community is more persuasive.

The definitions of the variables are shown in Table 2, and a descriptive statistic is also shown in Table 3. The average public assistance rate for the elderly is 1.95%. The average rate of elderly one-person households is 6.9% for males and 15.6% for females. The rates of age 65-74, and aged 75 and over are 10% and 8.1%, respectively. Life expectancy at age 65 is 17.2 for males and 21.6 for females. Prefectural income per capita is 2.52 million yen on average. The average rate of regular workers is 1.4% on average. The average unemployment rate was 4.2%. The owner-occupied ratio is 67.6%. The financial capability index is 0.47 on average.

Figure 6 shows the correlation between the rates of elderly single households and the public assistance for the elderly in 1990 and 2010. The proportion of elderly single households is higher in 2010 than in 1990 for both genders. The slope is steeper in males than in females for both periods. This indicates that the correlation between elderly single households and elderly receiving public assistance is stronger in males than in females, regardless of years. Focusing on periods, these correlations for females are stronger in 2010 than in 1990, while there is no difference in the correlation by years for males. These relations are focused on only two variables, without considering other effects. Thus, we estimate the effect of elderly single households on public assistance for the elderly.

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5. Results

5.1. Basic Model

The results are shown in Table 4–1. Columns (1)–(4) are the results of pooled OLS. The coefficients of elderly single-male households are positively significant in columns (1)–(3). This indicates that the higher the rate of elderly single-male households, the greater the public assistance rate for the elderly. For females, the coefficients of elderly single households are not significant except for column (1). This indicates that an increase in elderly single-female households does not affect the rate of public assistance for the elderly.

From the results of pooled OLS, we confirm a positive correlation between elderly single-male households and the public assistance rate for the elderly, after controlling for covariates such as demographic and economic conditions. However, these results might be spurious, as we do not control for fixed effects. For example, the elderly who face poverty do not need to rely on public assistance in areas where neighborhoods could help elderly single households. In contrast, the elderly could receive public assistance from neighborhoods in these areas. When variables affect dependent and independent variables at the same time, we arrive at a spurious correlation.

To deal with spurious correlations, we use a fixed effect model to control unobserved time-consistent effects. We also use a clustered robust standard error to consider the correlation of the error term among prefectures. The results in Table 4–1 (5)–(8). Columns (5)–(8) show that the coefficients of elderly single-male households are significant for all columns. This indicates a positive correlation between elderly single-male households, and the public assistance rate for the elderly is confirmed, even if prefectural fixed effects are considered. However, the coefficients of elderly single-

female households are not significant for all columns in fixed models. This indicates that the increase in elderly single-female households does not affect the rate of public assistance for the elderly.

The effects of elderly one-person households on the rate of public assistance for the elderly are quite different between genders. Elderly one-person households facilitate public assistance for the elderly, while elderly single-female households suppress it. As females are more sociable and apt at establishing connections with neighborhoods and communities, we believe they can rely on the support from communities or relatives who live near them. However, as elderly males can only rely on governmental support, the rate of elderly single-male households directly affects the rate of public assistance for the elderly.

The results of other variables are as follows. Demographic variables such as population structure and life expectancy are not significant in most cases considering prefectural fixed effects, except for the rate of aged 65–74 in columns (7) – (8). This suggests that the rate of elderly single-male households is more important in determining the prefectural difference of public assistance than other demographic factors, although the rate of those aged 65–74 has a positive correlation with public assistance for the elderly. The prefectural income per capita is positively significant, and the labor participant rate among the elderly is negatively significant.

5.2. Estimation by Period

As 5.1 suggests, the relationship between elderly single-male households and public assistance for the elderly is confirmed even if the prefectural fixed effect is considered. Next, we examine whether the relationship between one-person households and the public

assistance rate for the elderly is different by period. To examine this hypothesis, we divide the sample by year. Tables 4–2 (1)–(4) show the results using the sample after 2000. As columns (1)–(4) show, the coefficients of elderly single-male households are positively significant. In contrast, the coefficients of elderly single-female households are negatively significant at the 10% level in columns (3) – (4). These results suggest that the higher the rate of elderly single-male households, the more the elderly receive public assistance after 2000. However, the higher the rate of elderly single-female households, the less the elderly receive public assistance after 2000 with controlled covariates. In contrast, Tables 4–2 (5) – (8) show that the coefficients of elderly one-person households are insignificant for both genders at all columns. These results suggest that the effects of one-person households on the public assistance rate for the elderly are not observed before 1995 for both genders.

We interpret these results in the following way: At the stage when the aging society was not advanced and one-person households were not prominent, the increase in the elderly one-person households did not accelerate the rate of public assistance for the elderly with the support of neighboring residents and relatives living nearby. However, after the 2000s, the personalization of risks, as highlighted by Beck (1986), has progressed in Japan as well, and the household structure, family relationships, and regional support systems have changed. As a result, elderly individuals rely on public assistance from governments rather than nearby families and neighbors. For this reason, the increase in elderly one-person households has directly affected the rate of the elderly receiving public assistance.

5.3. Estimation by Area

We proceed to examine the personalization of risks caused by urbanization in Japan, dividing the sample into rural areas and city areas, wherein it is not relatively difficult for the elderly to rely on neighborhoods in the former but difficult in the latter. These results are shown in Tables 4–3. Columns (1)–(4) show the results for large city areas, and columns (5)–(8) show the results in rural areas. In city areas, the coefficients of elderly single-male households are positively significant in all columns, but in rural areas, it is insignificant in all columns. In other words, in city areas, many elderly single-male households facilitate the increase in public assistance rate for the elderly, but in rural areas, it cannot be said that the increase in elderly single-male households accelerates the increase in public assistance rate for the elderly.

We conclude these results in the following way. In areas where close interaction with family members and neighbors occurs, the large number of elderly single-male households does not lead to an increase in the public assistance rate for the elderly by being supported by family members and neighbors. This is shown by the fact that the coefficient of elderly single-male households is significantly positive in city areas, but not in rural areas. In contrast, since the late 1990s, the personalization of risks has progressed, and the large number of elderly single-male households has affected the high rate of receiving public assistance for the elderly. This was shown by the fact that the coefficient of elderly single-male households has a positive effect on the public assistance rate for the elderly after 2000.

6. Conclusion

In this study, we explore the factors behind the rapid increase in the number and ratio of the elderly receiving public assistance since the late 1990s while focusing on the rapid increase in elderly one-person households. Specifically, we tested the hypothesis that a

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large number of elderly one-person households would affect the increase in the proportion of the elderly receiving public assistance. We found a relationship between prefectural difference in the rate of one-person households and the one in the rate of the elderly receiving public assistance, despite controlling for the prefectural fixed effect.

Next, we divide the sample by period and area and find that the effect is observed in city areas, not in rural areas, and after 2000, not before 1995. We interpret these results as follows. Since an elderly single male has difficulty obtaining support from the neighborhood and local communities in large cities, he can rely on public assistance from the government. As a result, the large number of elderly single men leads to an increase in the number of elderly people receiving public assistance. In addition, a stronger correlation between the number of elderly single-male households and the elderly receiving public assistance has been observed after the late 1990s and in city areas. In other words, this study shows that increase in elderly single-male households directly contributes to the increase in the elderly receiving public assistance because of changes in family and regional relationships. As a result, the number of households receiving public assistance has risen rapidly since the late 1990s. Although the economic downturn caused by the collapse of the bubble economy since the 1990s also contributes to the increase in the number of households receiving public assistance, the increase in the number of the elderly receiving public assistance cannot be explained by the economic recession alone. We show the support from families and neighbors has changed since late 1990s and "personalization" has become apparent, especially in city areas. These results are consistent with Yamada and Shikata (2016), because they demonstrated the increase in the share of elderly one-person households who can rely on only public assistance leads

to the rising in the public assistance rate regardless of the decrease in poverty rate among elderly one-person households.

From these results, we derive two opposite implications. From a conservative standpoint, by providing community and family support as before the 1990s, curbing the increase in elderly single-male households, we should ensure that the increase in elderly single-male households does not affect the proportion of the elderly receiving public assistance. The position is that welfare by families and communities should be emphasized again, as in the so-called "Japanese social welfare theory," which was popular from the latter half of the 1970s to the 1980s. However, it is unrealistic seeking a solution by family support, as we cannot imagine family care for the elderly without a long-term care insurance system.

In contrast, on the premise of the personalization of Japanese society, one position emphasizes the direction of enhancing public support without expecting excessive support from the community and family. Furthermore, individuals who once had to rely on their community and family support could make their own decisions by living alone and receiving public support. This trend has a positive aspect, as the elderly want to decide on their life by themselves, as Klinenberg (2012) emphasized.

Which views are more appropriate? It depends not only on the individual opinion of how much should each entity such as among nations, communities, and families and individual are responsible for preventing poverty among the elderly, as it is said in the aspects of "self-, mutual-, and public-help," but also on self-determination by the elderly. Evaluating the welfare of the elderly from various perspectives is a possible further research direction.

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Table 1   Countries with a high proportion of the population aged 65 and over

Rank	1950		2015		2050(Predicted)	
	Country	Rate	Country	Rate	Country	Rate
1	France	11.40	**Japan**	26.02	**Japan**	36.37
2	Belgium	11.00	Italy	22.36	Spain	36.31
3	Island	10.97	Germany	21.12	Portugal	35.59
4	UK	10.83	Portugal	20.74	Greece	35.45
5	Estonia	10.60	Finland	20.26	Korea	35.27
6	Austria	10.42	Bulgaria	20.08	Italy	34.62
7	Sweden	10.19	Greece	19.95	(Taiwan)	34.50
8	Georgia	10.10	Sweden	19.60	Hong Kong [1]	33.91
9	Latvia	10.10	Latvia	19.28	Singapore	33.58
10	Germany	9.67	Denmark	19.05	Slovenia	32.52
⋮	⋮	⋮				
60	**Japan**	4.91				

Source: UN, World Population Prospects：The 2017 Revision

Figure 1   International comparison of relative poverty rates：2015
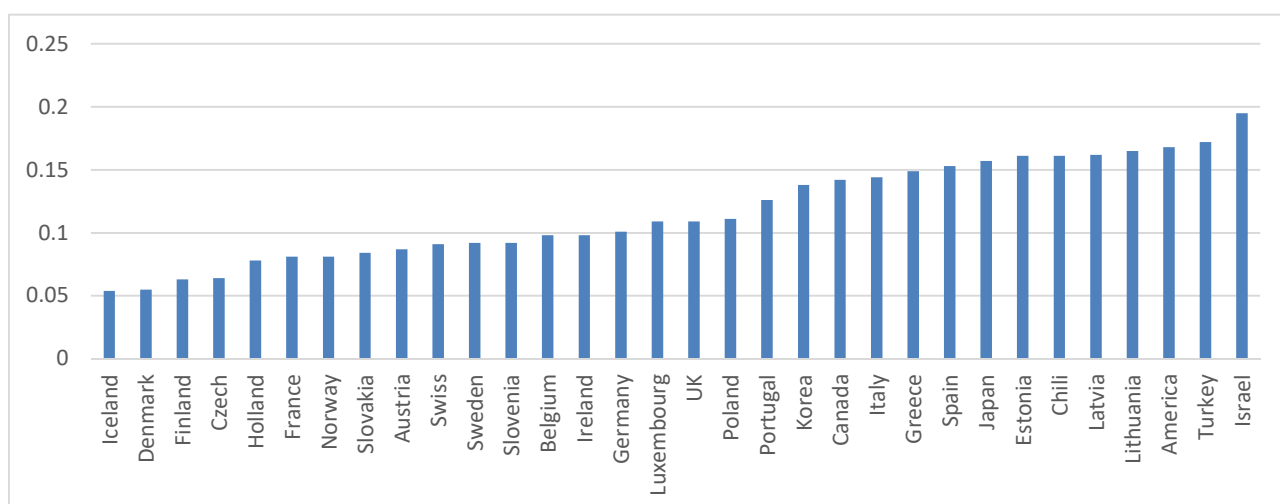
Source: OECD Factbook 2018

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Figure 2   Annual trend of the number of household receiving public assistance
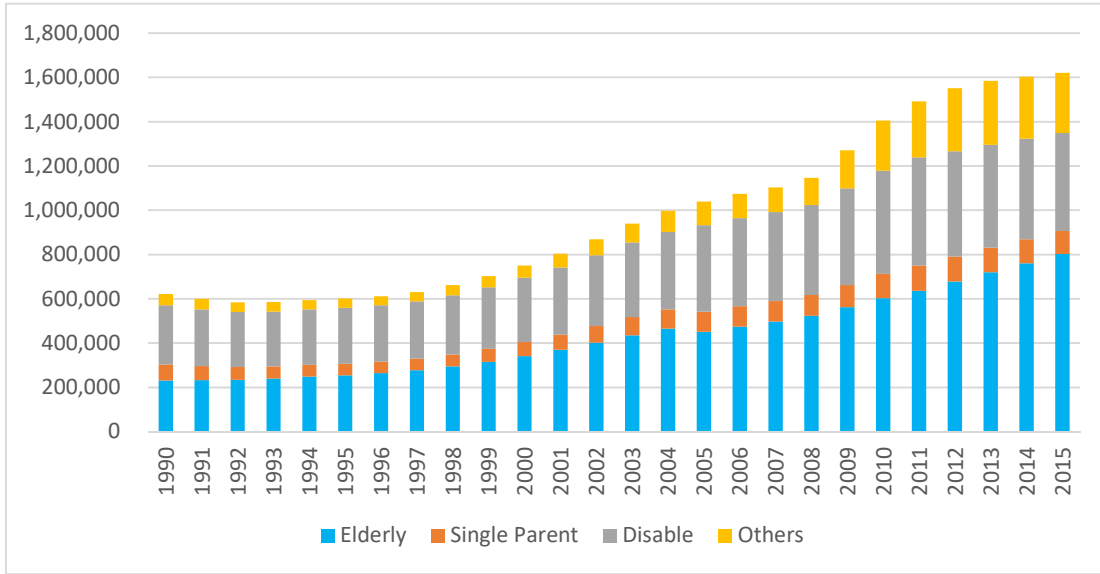
Source: Before 2011, Statistics Information Department "Social welfare administrative work report"

After 2012, Social Welfare and War Victims' Relief Bureau "National Survey on Public Assistance

Recipients" Monthly Survey

Figure 3－1   Trend in one-person households by age：Male
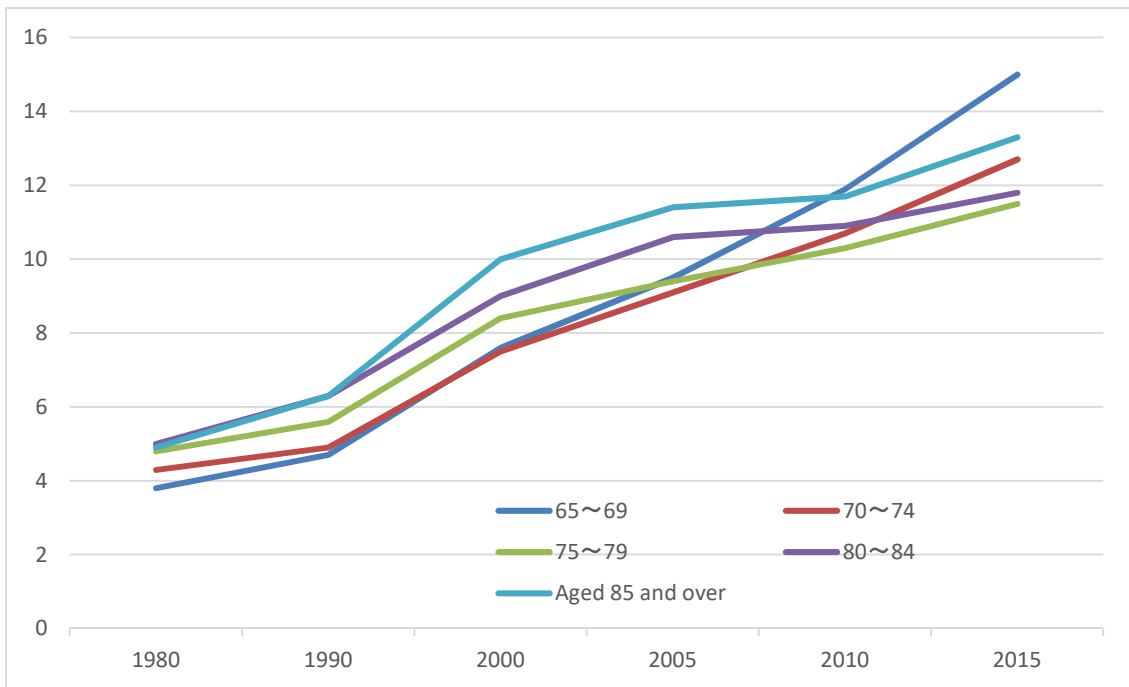
Source: Census

Figure 3－2　　Trend in one-person households by age：Female
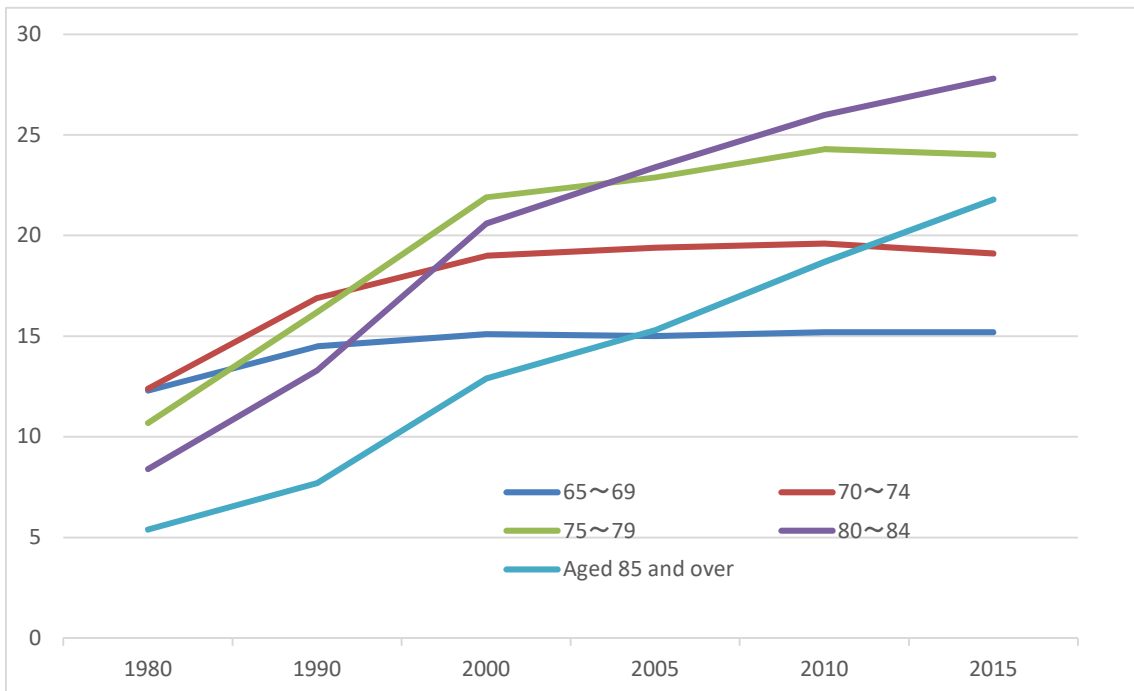
Source: Census

Figure 4 Trend and Forecast in one-person households
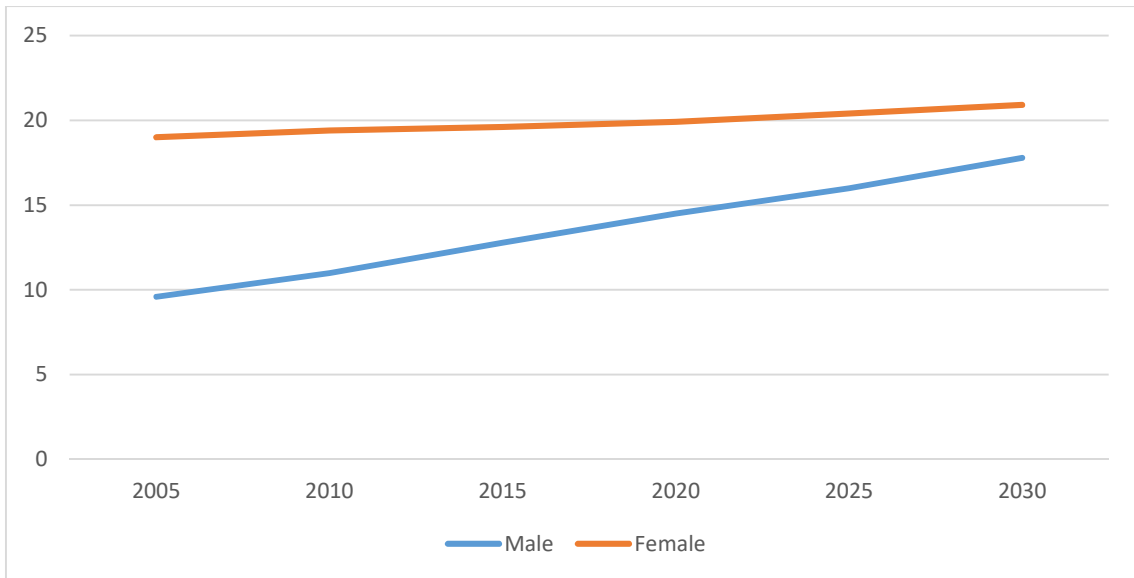
Source：National Institute of Population and Social Security Research "Forecast of the living conditions of the elderly"

Figure 5   The Rate of Single elderly household: by Prefecture
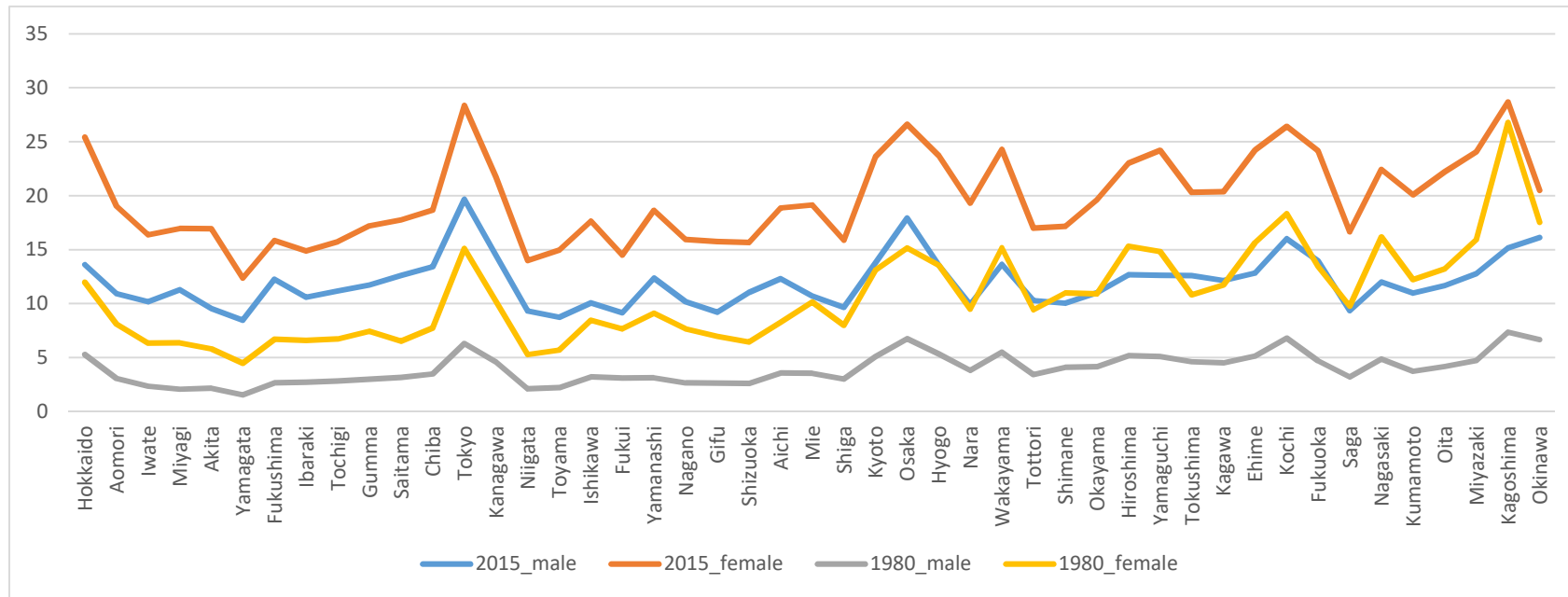
Source: Census

Table 2　Definition of Variables

Public Assistance Rate for the elderly: Monthly average over 65 years old per 1,000 people	Number of aged 65 and over receiving public assistance ／Population aged 65 and over	National Survey on Public Assistance Recipients
The rate of Elderly single-male(female) households	The number of elderly single-male(or female) households ／Male's(or Female's) Aged 65 and above	Census
Life Expectancy		Life Table
Prefectural Income per capita	Prefectural income／Population	Prefectural Accounts
Elderly Labor Participant Rate	Percentage of elderly general workers aged 65 and over ／Population aged 65 and over	Basic Survey on Wage Structure
Unemployment Rate		Census
Owned House ratio	Number of homes／Number of residential households	Housing and Land Survey of Japan
Financial Capability Index	Basic Amount Income／Basic Fiscal Demand	Local Financial Situation Survey

Figure 6. Relationship between single elderly household rate and the elderly receiving
   welfare rate
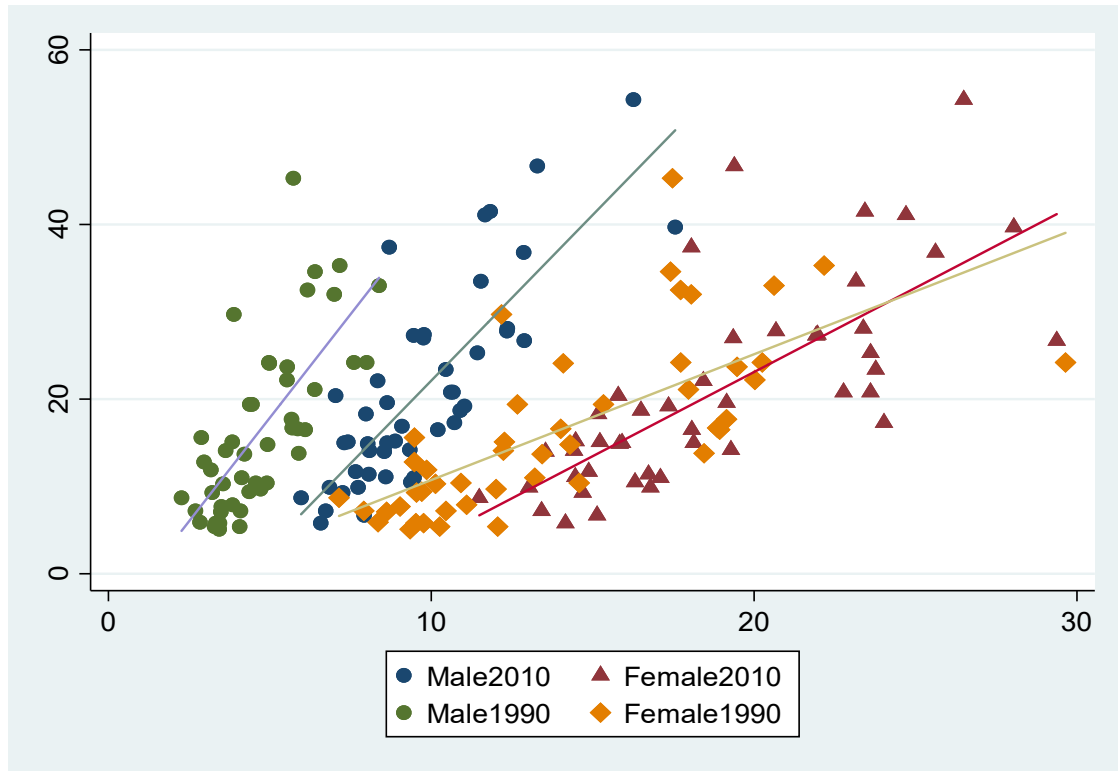
Table 3. Descriptive Statistics

	N	Mean	S.D.	Min	Max
Public Assistance Rate for the elderly	376	19.534	11.928	4.300	75.100
Elderly single-male households	376	6.923	3.346	1.564	19.676
Elderly single-female households	376	15.672	5.412	4.493	29.812
Rate of Aged 65-74	376	10.005	2.689	4.240	15.800
Rate of Aged 75 and over	376	8.125	3.874	1.919	18.292
Male's Life Expectancy at Aged 65	376	17.226	1.540	13.830	20.270
Female's Life Expectancy at Aged 65	376	21.649	2.227	17.220	25.190
Prefectural Income per capita	376	25.168	6.021	11.994	53.780
Elderly Labor Participant Rate	376	1.402	0.604	0.370	5.140
Unemployment Rate	376	4.244	1.706	1.200	11.900
Owned House Ratio	376	67.575	8.284	39.600	85.700
Financial Capability Index	376	0.472	0.214	0.205	1.622

Table 4－1　Determinants of public assistance rate for the elderly：Basic Model

VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	POLS	POLS	POLS	POLS	FE	FE	FE	FE
Elderly single-male households	2.711***	2.512***	1.774**	1.059	2.118***	2.103***	1.760***	1.638**
	(0.939)	(0.922)	(0.736)	(0.746)	(0.553)	(0.616)	(0.654)	(0.658)
Elderly single-female households	0.744*	0.642	0.494	0.318	0.157	-0.273	-0.896	-0.866
	(0.422)	(0.457)	(0.336)	(0.264)	(0.326)	(0.560)	(0.700)	(0.667)
Rate of Aged 65-74		0.122	1.067**	1.961***		0.567	1.472*	1.501*
		(0.450)	(0.441)	(0.570)		(0.545)	(0.739)	(0.777)
Rate of Aged 75 and over		-1.194**	-0.961**	-1.254***		-0.853	-0.563	-0.554
		(0.535)	(0.374)	(0.365)		(0.537)	(0.567)	(0.582)
Male's Life Expectancy at Aged 65		-15.63***	-8.034***	-6.568**		0.160	0.789	0.900
		(4.252)	(2.868)	(2.499)		(1.850)	(1.642)	(1.664)
Female's Life Expectancy at Aged 65		12.34***	4.777**	2.469		2.989	2.091	1.766
		(3.118)	(2.194)	(1.891)		(1.972)	(1.763)	(1.639)
Prefectural Income per capita			-0.0587	0.379**			0.578**	0.604**
			(0.207)	(0.174)			(0.241)	(0.254)
Elderly Labor Participant Rate			0.561	-0.400			-2.382***	-2.315***
			(1.404)	(1.006)			(0.718)	(0.698)
Unemployment Rate			4.357***	3.667***			1.060	1.078
			(1.247)	(0.963)			(1.276)	(1.279)
Owned House Ratio				-0.628***				-0.0198
				(0.179)				(0.179)
Financial Capability Index				-19.18***				-3.708
				(5.236)				(5.648)
Year Dummy	yes	yes	yes	yes	yes	yes	yes	yes
Observations	376	376	376	376	376	376	376	376
R-squared	0.615	0.695	0.776	0.814	0.663	0.683	0.720	0.720
Number of id					47	47	47	47

Note:　　1．Clustered robust standard errors in parentheses

2．*** $p<0.01$, ** $p<0.05$, * $p<0.1$

Table 4－2　　　　　Determinants of public assistance rate for the elderly：By Year

VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	After 2000				Before 1995			
	FE	FE	FE	FE	FE	FE	FE	FE
Elderly single-male households	2.093*	2.429**	2.040***	2.043***	2.821	2.339	-0.902	-0.927
	(1.117)	(1.011)	(0.708)	(0.632)	(2.403)	(1.772)	(1.803)	(2.020)
Elderly single-female households	-0.537	-1.024	-0.796*	-0.645*	-1.031	-0.634	-0.218	-0.386
	(0.584)	(0.636)	(0.419)	(0.349)	(1.633)	(1.396)	(0.846)	(0.803)
Rate of Aged 65-74		0.907	0.957**	0.931**		-4.879***	-1.230	-1.549
		(0.741)	(0.451)	(0.424)		(1.561)	(1.518)	(1.598)
Rate of Aged 75 and over		0.249	0.380	0.240		5.024**	4.925***	5.091***
		(1.153)	(0.680)	(0.643)		(2.214)	(1.553)	(1.573)
Male's Life Expectancy at Aged 65			-5.808***	-5.381***			8.645***	9.248***
			(1.859)	(1.787)			(2.723)	(2.770)
Female's Life Expectancy at Aged 65			3.418	2.836			-4.284*	-4.326*
			(2.331)	(1.918)			(2.132)	(2.190)
Prefectural Income per capita			0.0292	-0.00899			1.734***	1.776***
			(0.172)	(0.153)			(0.408)	(0.471)
Elderly Labor Participant Rate			-1.944*	-1.669*			0.555	0.677
			(1.014)	(0.977)			(0.878)	(0.823)
Unemployment Rate			-1.742***	-1.815***			3.699***	3.712***
			(0.553)	(0.546)			(1.333)	(1.321)
Owned House Ratio				0.144				0.250*
				(0.237)				(0.139)
Financial Capability Index				-14.20*				-3.632
				(7.099)				(6.185)
Year Dummy	yes	yes	yes	yes	yes	yes	yes	yes
Observations	188	188	188	188	188	188	188	188
R-squared	0.808	0.820	0.874	0.881	0.728	0.755	0.852	0.854
Number of id	47	47	47	47	47	47	47	47

Note:　　1．Clustered robust standard errors in parentheses
　　　　　2．*** $p<0.01$, ** $p<0.05$, * $p<0.1$

Table 4－3　　　　Determinants of public assistance rate for the elderly：By Area

VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	City Area				Rural Area			
	FE	FE	FE	FE	FE	FE	FE	FE
Elderly single-male households	3.426**	3.613***	3.707***	2.583**	0.217	0.432	0.525	0.661
	(1.361)	(0.774)	(0.794)	(0.915)	(1.257)	(1.094)	(1.059)	(1.033)
Elderly single-female households	-2.221	-2.677**	-2.764**	-2.196	-0.0936	-0.232	-0.621	-0.529
	(1.455)	(1.122)	(1.084)	(1.333)	(0.370)	(0.672)	(0.684)	(0.654)
Rate of Aged 65-74		2.221***	2.384**	2.905***		0.183	0.718	1.008
		(0.590)	(0.755)	(0.786)		(0.692)	(0.718)	(0.777)
Rate of Aged 75 and over		0.654	-0.184	-1.587		-0.496	-0.317	-0.208
		(1.549)	(1.190)	(1.563)		(0.638)	(0.651)	(0.634)
Male's Life Expectancy at Aged 65		-11.19**	-9.701*	-5.754		1.155	0.533	0.259
		(4.030)	(4.578)	(4.927)		(1.948)	(1.898)	(1.933)
Female's Life Expectancy at Aged 65		9.855**	9.329*	6.823		0.989	0.526	0.701
		(3.819)	(4.416)	(4.370)		(1.957)	(1.589)	(1.591)
Prefectural Income per capita			-0.0786	0.107			0.853***	0.827**
			(0.128)	(0.123)			(0.295)	(0.310)
Elderly Labor Participant Rate			-0.589	-0.522			-1.995***	-2.451***
			(0.707)	(0.506)			(0.606)	(0.701)
Unemployment Rate			-1.170	-1.426			1.209	1.239
			(0.970)	(0.993)			(1.513)	(1.464)
Owned House Ratio				0.466				-0.243
				(0.301)				(0.226)
Financial Capability Index				-8.139				6.697
				(5.658)				(11.41)
Year Dummy	yes	yes	yes	yes	yes	yes	yes	yes
Observations	64	64	64	64	312	312	312	312
R-squared	0.875	0.912	0.915	0.926	0.669	0.674	0.714	0.718
Number of id	8	8	8	8	39	39	39	39

Note:　　1．Clustered robust standard errors in parentheses
　　　　2．*** $p<0.01$, ** $p<0.05$, * $p<0.1$

Appendix A　Determinants of public assistance rate for the elderly：Basic Model

VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	POLS	POLS	POLS	POLS	FE	FE	FE	FE
Elderly single-male households	4.142***	3.925***	3.012***	1.758	3.665***	4.075***	3.325***	3.103***
	(1.160)	(1.316)	(1.087)	(1.085)	(0.711)	(0.818)	(0.805)	(0.848)
Elderly single-female households	1.052***	0.896*	0.594*	0.388	-0.506	-1.120	-1.898**	-1.988**
	(0.389)	(0.476)	(0.349)	(0.275)	(0.558)	(0.742)	(0.787)	(0.792)
Rate of Aged 65-74		-0.144	0.944**	1.900***		0.707	1.736***	1.616**
		(0.411)	(0.432)	(0.570)		(0.506)	(0.624)	(0.680)
Rate of Aged 75 and over		-1.192*	-0.839*	-1.192***		-0.0844	0.392	0.365
		(0.627)	(0.420)	(0.421)		(0.706)	(0.692)	(0.703)
Male's Life Expectancy at Aged 65		-16.07***	-8.533***	-6.858***		-1.418	-0.854	-0.766
		(4.336)	(2.937)	(2.522)		(1.796)	(1.496)	(1.501)
Female's Life Expectancy at Aged 65		12.36***	4.982**	2.600		4.929**	3.788**	3.609**
		(3.250)	(2.205)	(1.903)		(1.986)	(1.620)	(1.548)
Prefectural Income per capita			-0.00949	0.407**			0.631***	0.644***
			(0.199)	(0.162)			(0.202)	(0.209)
Elderly Labor Participant Rate			0.549	-0.408			-2.807***	-2.632***
			(1.368)	(1.010)			(0.667)	(0.656)
Unemployment Rate			4.465***	3.759***			1.117	1.102
			(1.188)	(0.923)			(1.099)	(1.128)
Owned House Ratio				-0.625***				0.128
				(0.177)				(0.150)
Financial Capability Index				-18.92***				-1.883
				(5.120)				(4.596)
Year Dummy	yes	yes	yes	yes	yes	yes	yes	yes
Observations	376	376	376	376	376	376	376	376
R-squared	0.610	0.695	0.777	0.813	0.678	0.701	0.749	0.751
Number of id					47	47	47	47

Note:　1．Clustered robust standard errors in parentheses

2．*** $p<0.01$, ** $p<0.05$, * $p<0.1$

Appendix B Determinants of public assistance rate for the elderly：By Year

VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
			After 2000				Before 1995	
	FE	FE	FE	FE	FE	FE	FE	FE
Elderly single-male households	2.883*	3.021**	2.375**	2.520***	5.461	6.015**	1.774	1.661
	(1.512)	(1.298)	(0.975)	(0.912)	(3.298)	(2.768)	(2.684)	(3.012)
Elderly single-female households	-0.240	-0.857	-0.493	-0.369	-2.705*	-1.859	-1.930*	-2.127**
	(0.685)	(0.666)	(0.437)	(0.386)	(1.600)	(1.707)	(1.043)	(0.976)
Rate of Aged 65-74		0.733	0.754*	0.736		-3.863***	-0.949	-1.393
		(0.601)	(0.446)	(0.451)		(1.289)	(1.546)	(1.607)
Rate of Aged 75 and over		0.391	0.629	0.474		5.040***	5.840***	6.108***
		(0.997)	(0.703)	(0.644)		(1.746)	(1.666)	(1.705)
Male's Life Expectancy at Aged 65		-7.128***	-5.972***	-5.498***		8.468	5.187	5.907*
		(2.578)	(1.881)	(1.780)		(5.141)	(3.252)	(3.298)
Female's Life Expectancy at Aged 65		3.917	3.279	2.652		-3.890*	-2.665	-2.701
		(2.963)	(2.426)	(1.975)		(2.235)	(2.177)	(2.208)
Prefectural Income per capita			0.0588	0.0162			1.677***	1.688***
			(0.179)	(0.156)			(0.420)	(0.483)
Elderly Labor Participant Rate			-1.854*	-1.550			-0.0954	0.0950
			(1.054)	(1.017)			(0.876)	(0.799)
Unemployment Rate			-1.763***	-1.826***			3.158**	3.174**
			(0.482)	(0.484)			(1.194)	(1.192)
Owned House Ratio				0.156				0.319**
				(0.246)				(0.135)
Financial Capability Index				-15.90**				-3.417
				(7.495)				(6.336)
Year Dummy	yes	yes	yes	yes	yes	yes	yes	yes
Observations	188	188	188	188	188	188	188	188
R-squared	0.808	0.836	0.869	0.877	0.758	0.792	0.862	0.865
Number of id	47	47	47	47	47	47	47	47

Note:　1．Clustered robust standard errors in parentheses
2．*** *p*<0.01, ** *p*<0.05, * *p*<0.1

Appendix C　　　　Determinants of public assistance rate for the elderly：By Area

VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	City Area				Rural Area			
	FE	FE	FE	FE	FE	FE	FE	FE
Elderly single-male households	5.591**	5.859***	5.892***	4.244**	0.610	1.822	1.703	1.780
	(1.853)	(1.208)	(1.260)	(1.256)	(1.447)	(1.228)	(1.317)	(1.304)
Elderly single-female households	-2.114	-2.928**	-3.113**	-2.728**	-0.907	-1.594	-1.878**	-1.817**
	(1.146)	(1.035)	(0.981)	(1.098)	(0.588)	(0.977)	(0.907)	(0.891)
Rate of Aged 65-74		0.694*	0.942	1.757**		1.012	1.456**	1.535*
		(0.348)	(0.641)	(0.664)		(0.751)	(0.714)	(0.779)
Rate of Aged 75 and over		3.100	2.401	0.544		0.210	0.452	0.479
		(1.911)	(1.399)	(1.840)		(0.788)	(0.756)	(0.752)
Male's Life Expectancy at Aged 65		-12.56**	-10.67*	-6.698		-0.562	-0.981	-1.180
		(4.161)	(4.545)	(4.844)		(1.936)	(1.868)	(1.890)
Female's Life Expectancy at Aged 65		10.58**	9.898*	7.204		3.649*	2.672	2.887*
		(3.774)	(4.351)	(4.092)		(2.066)	(1.729)	(1.712)
Prefectural Income per capita			-0.0327	0.127			0.820***	0.793***
			(0.127)	(0.120)			(0.266)	(0.279)
Elderly Labor Participant Rate			-0.817	-0.750			-2.478***	-2.763***
			(0.750)	(0.507)			(0.694)	(0.769)
Unemployment Rate			-1.161	-1.433			1.173	1.148
			(1.001)	(1.017)			(1.381)	(1.365)
Owned House Ratio				0.478*				-0.0795
				(0.226)				(0.187)
Financial Capability Index				-8.049				8.340
				(4.799)				(10.38)
Year Dummy	yes	yes	yes	yes	yes	yes	yes	yes
Observations	64	64	64	64	312	312	312	312
R-squared	0.890	0.919	0.922	0.934	0.683	0.697	0.740	0.742
Number of id	8	8	8	8	39	39	39	39

Note:　　1．Clustered robust standard errors in parentheses
　　　　　2．*** $p<0.01$, ** $p<0.05$, * $p<0.1$