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Demographic Components of Future Population Growth Rates by Municipalities in Japan: Supplementary Materials

KAMATA Kenji, KOIKE Shiro, SUGA Keita
and YAMAUCHI Masakazu

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National Institute of Population and Social Security Research

Hibiya Kokusai Building 6F, 2-2-3 Uchisaiwaicyo, Chiyoda-ku, Tokyo 100-0011

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Demographic Components of Future Population Growth Rates by Municipalities in Japan: Supplementary Materials[1]

KAMATA Kenji[2], KOIKE Shiro[2], SUGA Keita[2] and YAMAUCHI Masakazu[3]

Abstract

This is a supplement to the paper (Kamata et al. 2020a), on the decomposition of future population growth rates by municipalities in "The Regional Population Projections for Japan: 2015-2045" (The National Institute of Population and Social Security Research (IPSS) 2018). In this paper, we present additional tables and figures, including assumptions and the geographical distribution of demographic components. The analysis covers 1,682 municipalities, excluding those in the Fukushima Prefecture. The main results are as follows: (1) The contribution to future population growth is large for age structure and migration factors; the contribution of mortality factors is less than 5% regardless of population size, and the contribution of fertility factors is generally small. (2) Under the assumption that population growth is promoted, the contribution of an increase in the fertility rate to the future population growth rate is greater in regions with larger populations, and the contribution of a halving of the net migration rate to the future population growth rate is greater in regions with smaller populations.

1. Introduction

The National Institute of Population and Social Security Research (IPSS) released "The Regional Population Projections for Japan: 2015–2045" in March 2018. This projection took the results of "The Population Census of Japan (2015)" (Statistics Bureau, Ministry of Internal Affairs and Communications) as the base population, and it projected the future population by five-year age groups and sex for every five-year period between 2020 and 2045 (IPSS 2018). The geographical units that the projection covered included 1,798 municipalities (23 Tokyo special wards, 128 wards in 12 major cities, 766 cities, 713 towns, and 168 villages), in accordance with the official boundaries as of March 1, 2018, and one prefecture (Fukushima Prefecture). The sum of the population in the geographical units reported here by age and sex is consistent with the medium-variant fertility and medium-variant mortality projection results of the national projections (IPSS 2017). In Kamata et al. (2020a), four

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[2] National Institute of Population and Social Security Research
[3] Waseda University

demographic components of future population change were identified following the methodology proposed by Bongaarts and Bulatao (1999) and prefectural patterns of the components were displayed.

This paper first summarizes the method of analysis and shows the distribution of the fertility rate, survivorship ratio, and net migration rate used in the decomposition. Next, the frequency distributions of the future population growth rate and each factor by population size in 2015 are examined. Third, we show the geographical distribution of the contribution of each factor. The analysis covered 1,682 municipalities, excluding those in the Fukushima Prefecture.

2. Method

Bongaarts and Bulatao's (1999) factor decomposition method decomposes the population growth rate into four factors: age structure factors of the base population, fertility factors, mortality factors, and migration factors. Table 1 shows the base population P and decomposition results for each of the four scenarios. The standard scenario P_s is the result of projecting the demographic rate in "The Regional Population Projections for Japan: 2015–2045" (2018), where the natural increase and decrease scenario P_n is the result of changing the net migration rate to zero among the assumptions of the standard scenario, and the life expectancy extension scenario P_r is the result of changing the net migration rate to zero and the fertility rate to a constant after 2015. The age structure scenario, P_m, is the result of changing the survivorship ratio to a constant from 2015 to 2020.

By taking the ratio of the projected population of the four scenarios to the base population, the multiplier M for each factor can be obtained. The multipliers for each factor are (1) the age structure factor multiplier $M_m=P_m/P$, (2) the fertility factor multiplier $M_b=P_n/P_r$, (3) the mortality factor multiplier $M_d=P_r/P_m$, and (4) the migration factor multiplier $M_{mg}=P_s/P_n$.

To interpret the results of the analysis, we used the contribution of each factor to the future population growth rate. The contribution is the ratio of the population change caused by each factor to the base population (2015), and the sum of the contributions of each factor is the population growth rate for the relevant period.

In this paper, we analyze the results of the regional projections (2018) for population growth over the 30-year period from 2015 to 2045 and present the results based on two types of assumptions that promote population growth (Table 1). The first assumption (hereafter, population growth assumption I) is that (1) the fertility rate reaches the population replacement level, (2) the average life expectancy increases from 2040 to 2045 and (3) the net migration rate is the same as that in the regional projections (2018). The second assumption (hereafter referred to as population growth assumption II) is based on (1) and (2) plus (3') a uniform halving of the net migration rate.

3. Definition of the Assumptions

It should be noted that the assumptions for future population projections used in this analysis, with the exception of survivorship ratios, differ from the assumptions published by IPSS (2018).

(1) Fertility Assumption: Adjusted Fertility Rates

The adjusted fertility rate is the age-specific fertility rate (ASFR), which is consistent with the future population aged 0-4 years in the IPSS report (2018). In the analysis of prefectures, the relative disparity ratios between the assumption of national-level ASFR and each prefecture's ASFR by five-year age group as of 2015 is multiplied by the future age-specific fertility rate by five-year age group in the "Future Population Projections for Japan" (IPSS 2017). The future age-specific fertility rate for each prefecture was calculated by multiplying the future ASFR in the IPSS (2017), and then $ASFR(t)_{i,x}^{C}$ was calculated by multiplying the ratio of the number of births over the five-year period and the population aged 0-4 years obtained from the IPSS report (2018) (Kamata et al. 2020b). The adjusted fertility rate includes the survivorship ratio and net migration rate of the population aged 0-4 years from birth, and the change that occurred due to an adjustment with the national projection (IPSS 2017).

The adjusted fertility rate for municipalities $ASFR(t)_{j,x}^{C}$ is calculated as follows: (1) the unadjusted fertility rate for municipality $ASFR(t)_{j,x}$ is calculated by multiplying the adjusted fertility rate for each prefecture $ASFR(t)_{i,x}^{C}$ by the ratio of the child-woman ratio (CWR) for each municipality and prefecture for each five-year period from 2020 to 2045 in the IPSS report (2018): $CWR(t)_j/CWR(t)_i$, where *i* is the prefecture, *j* is the municipality, *x* is the age at 5-year intervals from to 15-19 to 45-49, and *t* is the time at 5-year intervals from 2020 to 2045.

$ASFR(t)_{j,x} = ASFR(t)_{i,x}^{C} \times \left(CWR(t)_j/CWR(t)_i\right)$

(2) The ratio of the number of births over five years obtained from the estimation results using $ASFR(t)_{j,x}$ to the population aged 0-4 years obtained from the IPSS report (2018) is used as the adjusting ratio $C(t)_j$

$$C(t)_j = P(t)_{j,0\sim4} \Big/ \sum_{15\sim19}^{45\sim49} \left(P(t)_{j,x} \times ASFR(t)_{j,x}\right)$$

3) Multiplying $ASFR(t)_{j,x}$ by $C(t)_j$, we created the adjusted fertility rate by 5-year age group for each municipality, $ASFR(t)_{j,x}^{C}$.

$$ASFR(t)_{j,x}^{C} = ASFR(t)_{j,x} \times C(t)_j$$

The adjusted fertility rate for population replacement level, $ASFR(t)_{j,x}^{R}$, assumes that the population replacement level is 2.07 for all municipalities, and the ratio of the total adjusted fertility rate in this estimation, $\sum_{15\sim19}^{45\sim49} ASFR(t)_{j,x}^{C}$ is calculated as the fertility rate by age in each municipality multiplied by $ASFR(t)_{j,x}^{C}$. The sex ratio of the population aged 0-4 years was calculated using the value for each municipality obtained from IPSS (2018).

$$ASFR(t)^{R}_{j,x} = ASFR(t)^{C}_{j,x} \times \left(\frac{2.07}{\sum_{15\sim19}^{45\sim49} ASFR(t)^{C}_{j,x}}\right)$$

Figure 1 shows the distribution of the adjusted fertility rate for each municipality from 2015 to 2045. The median distribution remains constant at approximately 1.6, and the distribution of each municipality ranges from 2.0 to 2.1 for the 90th percentile and 1.3 for the 10th percentile. Figure 2 also shows the distribution of adjusted fertility rates by age from 2015 to 2045: for 15-19 to 30-34 years old, there is almost no change from 2015 to 2045; for 35-39 years old, the rate decreases from 2015 to 2025 and then levels off; for 40-44 years old, the rate increases from 2015 to for those aged 40-44, it increases from 2015 to 2020 and then levels off.

(2) Mortality and migration assumptions: Survivorship ratio and net migration rates

The future survivorship ratio by sex and age, $S(t)_{j,x}$, is the assumption published by IPSS (2018), wherein *j* is the municipality, *x* is the gender age group, from 0-4 to 5-9 to 85+ to 90+, and *t* is the time from 2015 to 2020 to denote time points at 5-year intervals from 2040 to 2045.There is little difference in the distribution of survivorship ratios by age for males and females, except that females have a more rectangular distribution, reflecting their longer life expectancy.

The future net migration rate by sex and age, $NM(t)_{j,x}$, is the value obtained by subtracting the survivorship ratio $S(t)_{j,x}$ from the cohort change ratio $CCR(t)_{j,x}$, where *j* is the municipality, *x* is the age group years old to 85+ years old to 90+ years old, and *t* is the time point at 5-year intervals from 2015 to 2020 to 2040–2045.

$$NM(t)_{j,x} = CCR(t)_{j,x} - S(t)_{j,x}$$

The distribution of the net migration rate by age group for men and women shows large fluctuations from teens to 30s, with the net migration rate becoming more positive in metropolitan areas and negative in non-metropolitan areas. For males, the median distribution is significantly negative in their teens, turns positive in their late 20s, and then remains constant, becoming positive in older age groups. For females, however, the distribution was still negative in their teens, but there was no increase in their late twenties, and the distribution remained negative.

4. Results

Table 2 shows the median difference between the results of demographic decomposition and each type of scenario and the contribution of each factor for the period 2015-2045, by population size as of 2015. First, the median population growth rate for the period was -34.9% for the total number in the IPSS report (2018), and the median contribution of each factor was -27.6% for age structure factors, -0.2% for fertility factors, 4.7% for mortality factors, and -11.0% for migration factors. By population size as of 2015, the rate of population growth decreased as the size of the population increased (from -49.4% for a population of less than 10,000 to -7.5% for a population of 1 million or more). The contribution of age-structure factors followed the same trend (from -36.2% to -19.3%). The contribution of fertility factors is positive (0.2%) for a population of less than 10,000, but negative (-0.1% to -0.7%) for a population of 10,000 or more. The contribution of mortality factors was generally positive, ranging from 4.6% to 4.8%, with no trend according to population size. The negative contribution of the migration factor is negative for a population of less than 300,000, and the negative contribution increases as the population size decreases (-16.9% for a population of less than 10,000). However, the contribution is positive for a population size of 300,000 or more, especially for a population size of 1 million or more (11.1%).

The results based on the population growth assumption include “Population Growth Assumption I: PGA I” (population replacement level fertility rate, constant survivorship ratio from 2040 to 2045, and net migration rate, as in the IPSS 2018) and “Population Growth Assumption II: PGA II” (population replacement level fertility rate, constant survivorship ratio from 2040 to 2045, and net migration rate halved). The difference between the two simulations is that the net migration rate in PGA I was uniformly halved in PGA II. Looking at the population growth rate for the total population, PGA I was -31.2%, and PGA II was -23.9%. The negative impact of the population growth rate is mitigated by the fact that the fertility rate increased in many areas and the number of deaths decreased. The negative impact is reduced in areas where excess migration is observed by halving the net migration rate under PGA II. Since PGA I is based on the assumption that the fertility rate will increase with the same migration trend, assuming that the trend of concentration in metropolitan areas will continue, the population growth rate will be higher in regions with larger population sizes. However, under PGA II, the population growth rate tended to be higher in regions with smaller population sizes (i.e., the population decline rate is mitigated) because the migration trend was reduced. In terms of the contribution of each factor, the total contribution of the fertility factors was 5.8%, and the contribution increased as the population size increased (from 3.8% below 10,000 to 11.7% above 1 million). The total contribution of mortality factors was 5.4%, and the difference between population sizes was small. The total contribution of migration factors under population growth assumption I was -13.6%, and it increased as the population size increased (from -19.9% to 13.5%). In PGA I, the total number of factors contributing to population growth was − -13.6%, and their contribution increased as the population size increased (from -19.9% to 13.5%). In PGA II, the contribution was approximately half of that in PGA I (-6.8% for the total number of factors, and from -10.9% to 6.8%).

Next, looking at the differences between the different assumptions, the increase in the population growth rate under PGA I was 3.7% (from 1.6% under 10,000 to 14.4% over 1 million) and that under PGA II was 10.2% (from 10.6% to 8.4%). The difference between PGA I and PGA II was the same as the difference between migration factors: 6.5% (from 8.9% to -6.9%), and the increase in the population growth rate was larger in regions with smaller population sizes, with half of the regions with population sizes of 300,000 or more having negative growth rates. The difference between the

IPSS report (2018) and the assumption of population growth for fertility factors was 5.9% (from 3.7% to 12.2%), with the increase becoming more positive as the population size increased, while the contribution of mortality factors was approximately 0.8%, with the same level of positive contribution, regardless of population size. In terms of migration factors, PGA I was -2.0% (from -2.5% to 2.9%), and PGA II was 3.7% (from 5.8% to -3.5%).

Table 3 shows the distribution of the population growth rates by population size in 2015. In the total population in the IPSS report (2018), the proportion of municipalities with a population growth rate of the category between -60% and -40% from 2015 to 2045 was the highest at 35.1%, followed by -40% to -20% (33.0%), -20% to 0% (20.5%), and 94.4% of the municipalities had a negative population growth rate for the next 30 years. In terms of the distribution by population size, the population growth rate tended to be lower in municipalities with smaller population sizes, with the largest number of municipalities in the -60% to -40% category for municipalities with fewer than 50,000 people, and the -20% to 0% category for municipalities with more than 100,000 people. The percentage of municipalities with positive population growth rates exceeded 20% for population sizes of 500,000 or more. Under the assumption of population growth, the overall population growth rate was distributed in a positive direction, and the impact of fertility and migration factors was large, with the positive impact of a fertility rate of 2.07, being large in municipalities with a large population size and a high proportion of young people. In PGA I, the migration trend was assumed to remain unchanged; therefore, the rate of population growth was higher in municipalities with larger populations, reflecting the tendency to concentrate in metropolitan areas (especially the Tokyo metropolitan area). On the contrary, PGA II uniformly halved the net migration rate, which had a positive effect on the population growth rate in municipalities with smaller population sizes.

Table 4 compares the results for different types of scenarios. 91.9% of the municipalities showed higher population growth rates in IPSS report (2018) and PGA I, and all municipalities with a population size of 300,000 or more showed positive results. In comparison with PGA II, the population growth rate was higher in 97.7% of the regions, 98.7% in municipalities with less than 10,000 inhabitants, and positive in all municipalities with a population of 500,000 or more. A comparison of PGA I and II shows that the population growth rate tends to be higher in municipalities with smaller population sizes, partly because of the effect of halving the net migration rate. Figure 5(A) shows the geographic distribution of the population growth rate by municipality for each type of estimation. It can be seen that the population growth rate was higher in metropolitan areas and lower in non-metropolitan areas. Under PGA I, the number of municipalities with positive population growth rates in metropolitan areas (red) increased and the negative population growth rates in suburban areas of metropolitan areas were mitigated (blue to light blue). In PGA I, the number of regions with positive population growth rates (red) increased in metropolitan areas and the negative population growth rate in suburban areas of metropolitan areas was mitigated (from blue to light blue).

Table 5 shows the distribution of the contributions of age structure factors. The contribution to the rate of population growth was highest in the -40% to -20% category, at 61.2%. Although there is some variation in regions with fewer than 10,000 inhabitants, more than 90% of regions with more than 10,000 inhabitants are generally included in the -40% to 0% range. Figure 5(B) shows the geographic distribution of the age structure factor; the distribution of the negative contribution is nationwide. The negative contribution was larger in municipalities with higher aging rates, such as the non-urban areas of Hokkaido, Akita, Aomori, Yamagata, Iwate, Kochi, Tokushima, Oita, and southern Nara Prefectures, and the mountainous areas of the Chugoku region.

Table 6 shows the distribution of the contributions of fertility factors. Out of the IPSS report (2018), 78.6% were distributed in the range of -1% to 2%. The positive contribution of fertility factors was greater in regions with smaller population sizes and the negative contribution was greater in regions with larger population sizes. On the other hand, under PGA I and II, the overall positive contribution became larger, with all municipalities with a population size of 300,000 or more having a positive contribution from fertility factors and municipalities with a larger population size having a positive contribution of 10% or more.

Table 7 shows a comparison of the contributions of fertility factors among the types of scenarios. Compared with IPSS report (2018), the contribution of fertility factors is higher in 92.2% of the regions under population growth assumptions I and II, and the contribution of fertility factors is higher in municipalities with larger population sizes. Figure 5(C) shows the geographic distribution of the fertility factors. In the IPSS (2018) projection, the distribution of negative contributions is widespread in non-urban areas in Hokkaido, and in areas excluding the Tohoku region, Kyushu region, and Okinawa Prefecture, but under PGA I and II, the contribution is positive nationwide, and is higher in metropolitan areas. The reason for the negative contribution in southern Nara Prefecture, parts of Miyazaki Prefecture, southern Kagoshima Prefecture, islands, and Okinawa Prefecture is that the adjusted fertility rate in the IPSS report (2018) is higher than 2.07, and setting the rate uniformly at 2.07 would reduce the contribution.

Table 8 shows the distribution of the contributions of the mortality factors. In the IPSS (2018), 80.7% of the mortality factors were included in the 4%-5% category and 98.3% if the 5%-6% category was included, with almost no difference between population sizes. Under the assumption of population growth, the contribution of mortality factors increased as the most frequent category became 5% to 6%, and there was almost no difference between population sizes.

Table 9 shows a comparison of the contributions of mortality factors among the different scenarios. Compared with the IPSS report (2018), the contribution of mortality factors increased in 99.9% of the municipalities under PGA I and II. The remaining 0.1% of municipalities remained unchanged in both cases. Figure 5(D) shows the geographic distribution of the contribution of the mortality factors. Although regional differences across the country were small, positive contributions were high in the Tohoku region, northern Kanto, Gifu, Wakayama, Hyogo, Shikoku, northern Kyushu, Kagoshima, and Okinawa prefectures, while they were relatively small in other regions. The same is true for population growth assumptions I and II.

Table 10 shows the distribution of the contributions of the mobility factors. The contribution of migration factors in IPSS (2018) was highest in the -20% to -10% category (37.7%), and municipalities with negative contributions accounted for 80% of the total, mainly in municipalities with small population sizes. PGA I assumed a tendency to migrate to metropolitan areas (especially the Tokyo metropolitan area); thus, the contribution of migration factors in metropolitan areas was high. On the other hand, PGA II assumed a uniform halving of the net migration rate, which reduced the overall variability, increasing the negative contribution of municipalities with small populations and decreasing the positive contribution of municipalities with large populations.

Table 11 shows a comparison of the migration factors among the various scenarios. 13.3% of the municipalities showed an increase in the contribution of migration factors under PGA I compared to the IPSS report (2018), while 78.6% of the municipalities showed an increase in the contribution under PGA II, mainly in municipalities with small population sizes. Between PGA I and II, 82.8% of the municipalities in PGA II showed an increase in the contribution of the migration factors. Figure 5(e) shows the geographical distribution of the contribution of the migration factors. In the geographic distribution of the IPSS (2018), the positive contribution was high in the Tokyo metropolitan area and other metropolitan areas, as well as Sapporo and Fukuoka. PGA I showed the same geographic distribution, with an increasing positive contribution from urban areas and a further negative contribution from areas with negative migration factors. On the other hand, under PGA II, the positive contribution of metropolitan and urban areas decreased, while the negative contribution of non-metropolitan areas began to increase.

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Table 1 The Scenarios of Projections, Assumptions and Multipliers

Scenarios of Projections	Assumptions	Results	Multipliers
1. Regional Population Projections for Japan (2018): 2015-2045			
1. Standard	Momentum, Mortality, Fertility[1], Migration[2]	P_s	$P \cdot M_m \cdot M_d \cdot M_b \cdot M_{mg}$
2. Natural	Momentum, Mortality, Fertility[1]	P_n	$P \cdot M_m \cdot M_d \cdot M_b$
3. Replacement	Momentum, Mortality	P_r	$P \cdot M_m \cdot M_d$
4. Momentum	Momentum	P_m	$P \cdot M_m$
2-1. Simulation I: 2015-2045			
5. Standard	Momentum, Mortality[3], Fertility[4], Migration[2]	P_{s_I}	$P \cdot M_m \cdot M_{dI} \cdot M_{bI} \cdot M_{mgI}$
6. Natural	Momentum, Mortality[3], Fertility[4]	P_{n_I}	$P \cdot M_m \cdot M_{dI} \cdot M_{bI}$
7. Replacement	Momentum, Mortality[3]	P_{r_I}	$P \cdot M_m \cdot M_{dI}$
8. Momentum	Momentum	P_m	$P \cdot M_m$
2-2. Simulation II: 2015-2045			
5. Standard	Momentum, Mortality[3], Fertility[4], Migration[5]	P_{s_II}	$P \cdot M_m \cdot M_{dI} \cdot M_{bI} \cdot M_{mgII}$
6. Natural	Momentum, Mortality[3], Fertility[4]	P_{n_I}	$P \cdot M_m \cdot M_{dI} \cdot M_{bI}$
7. Replacement	Momentum, Mortality[3]	P_{r_I}	$P \cdot M_m \cdot M_{dI}$
8. Momentum	Momentum	P_m	$P \cdot M_m$

"Note: 1. Adjusted fertility rates: The fertility rates are the age-specific fertility rates to obtain the number of births consistent with the projected results of the population aged 0-4 years in the regional projections (2018).
2. The net migration rate is calculated by subtracting the future survival rate from the cohort change rate, which is obtained from the results of the regional projections (2018).
3. The survival rate is the rate for the period from 2040 to 2045 in the regional population projections (2018).
4. The fertility rate at the population replacement level is the ratio of the national fertility rate at the population replacement level of 2.07 to the sum of the age-specific adjusted fertility rates for each municipality, multiplied by the adjusted fertility rate.
5. The net migration rate is uniformly cut in half.
6. Each multiplier is based on (1) the age structure factor $M_m=P_m/P$, (2) the birth factor $M_b=P_n/P_r$, (3) the death factor $M_d=P_r/P_m$, and (4) the migration factor $M_{mg}=P_s/P_n$, where P is the base population."

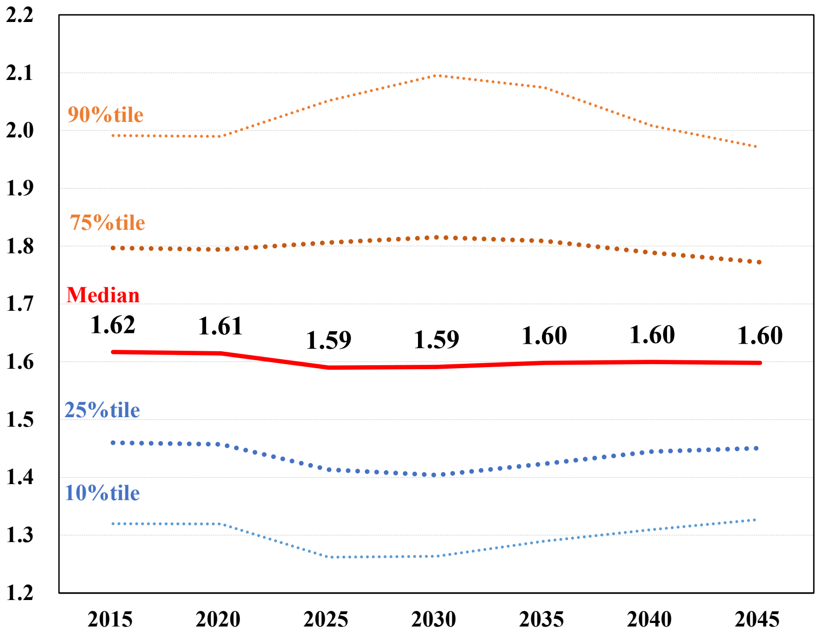


Figure 1 Distribution of Total Fertility Rates: 2015-2045

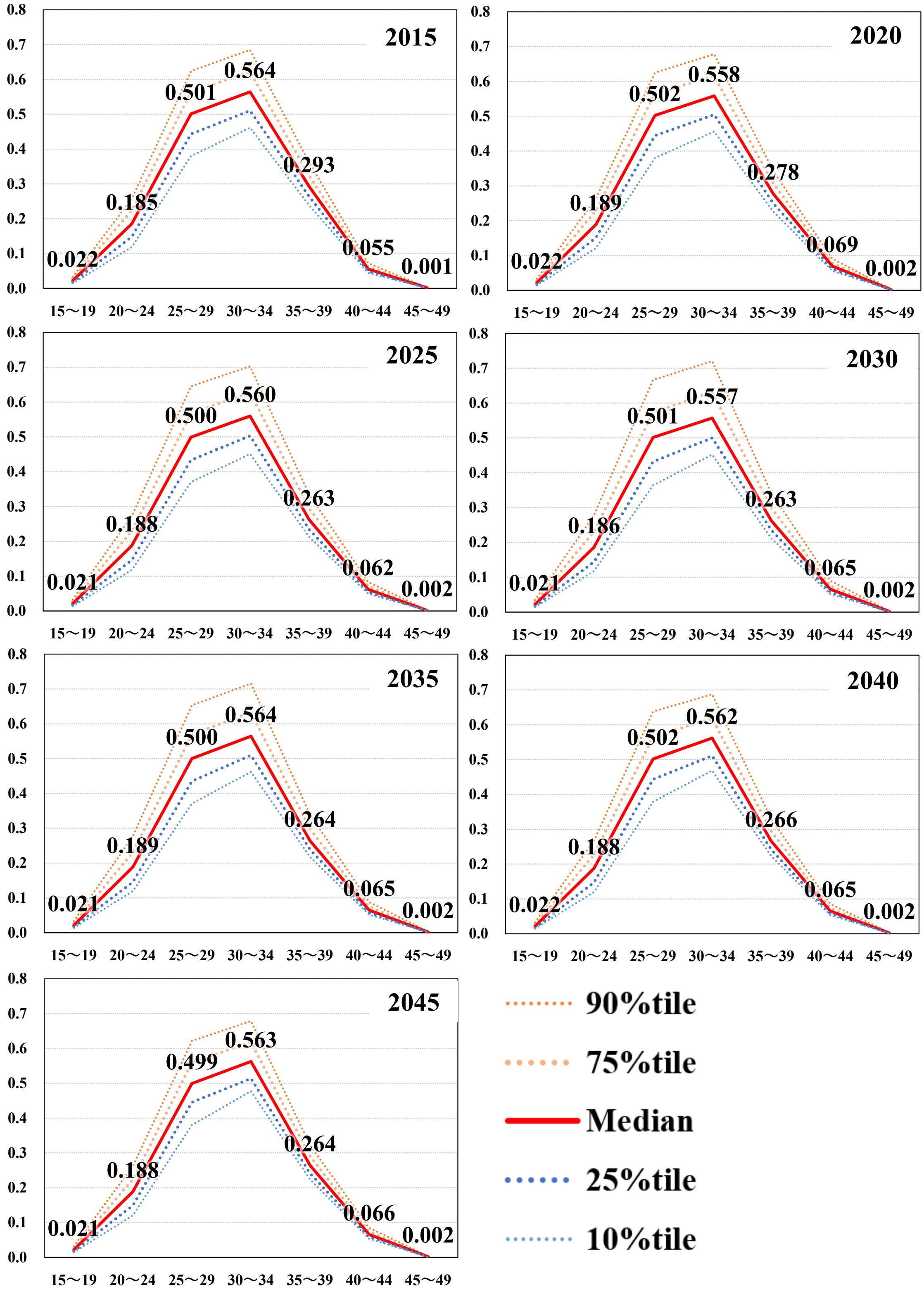


Figure 2 Distribution of age-specific fertility rate: 2015-2045

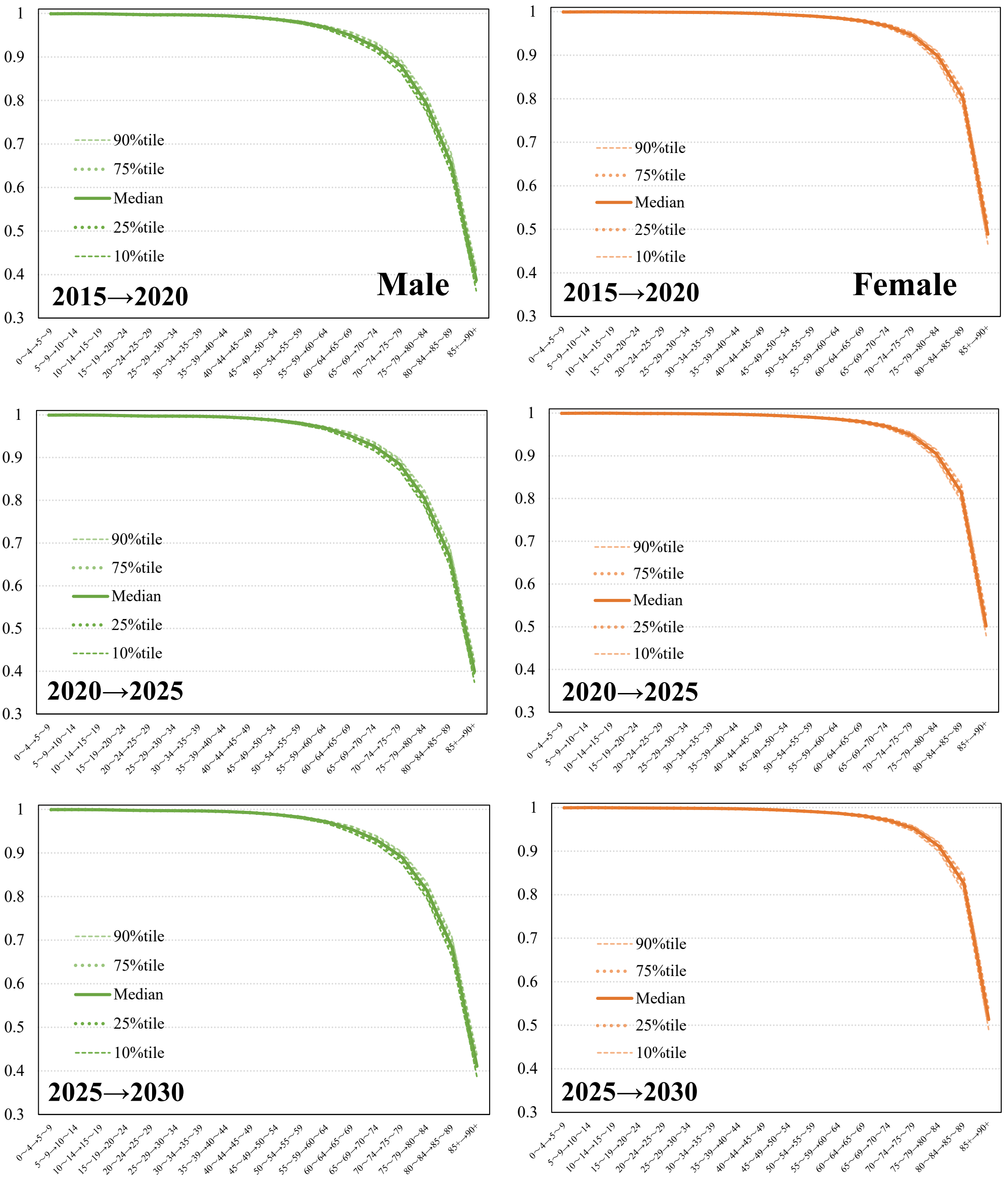


Figure 3 Distribution of age-specific survivorship ratios by sex:

2015→2020~2040→2045

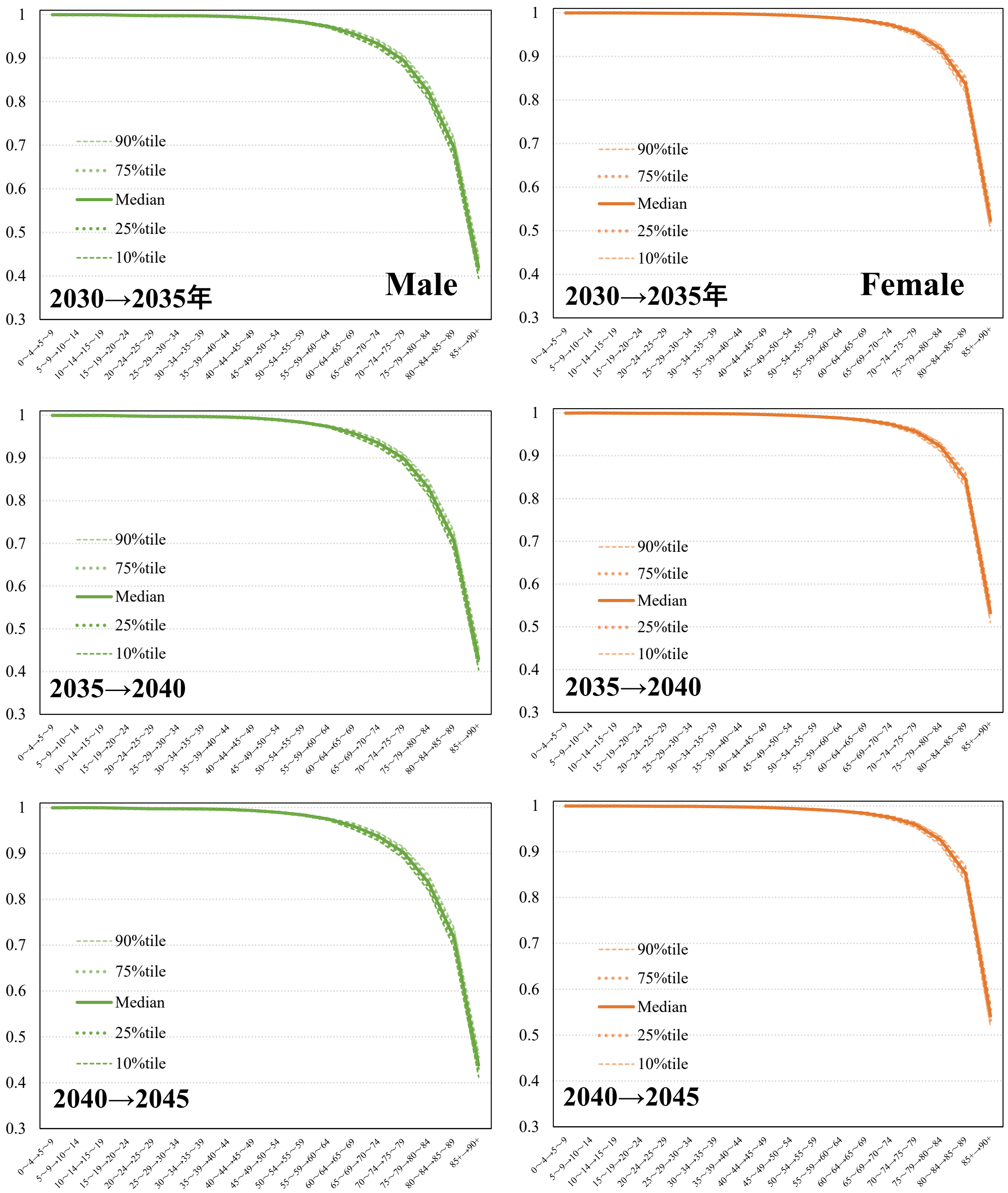


Figure 3 (continued)

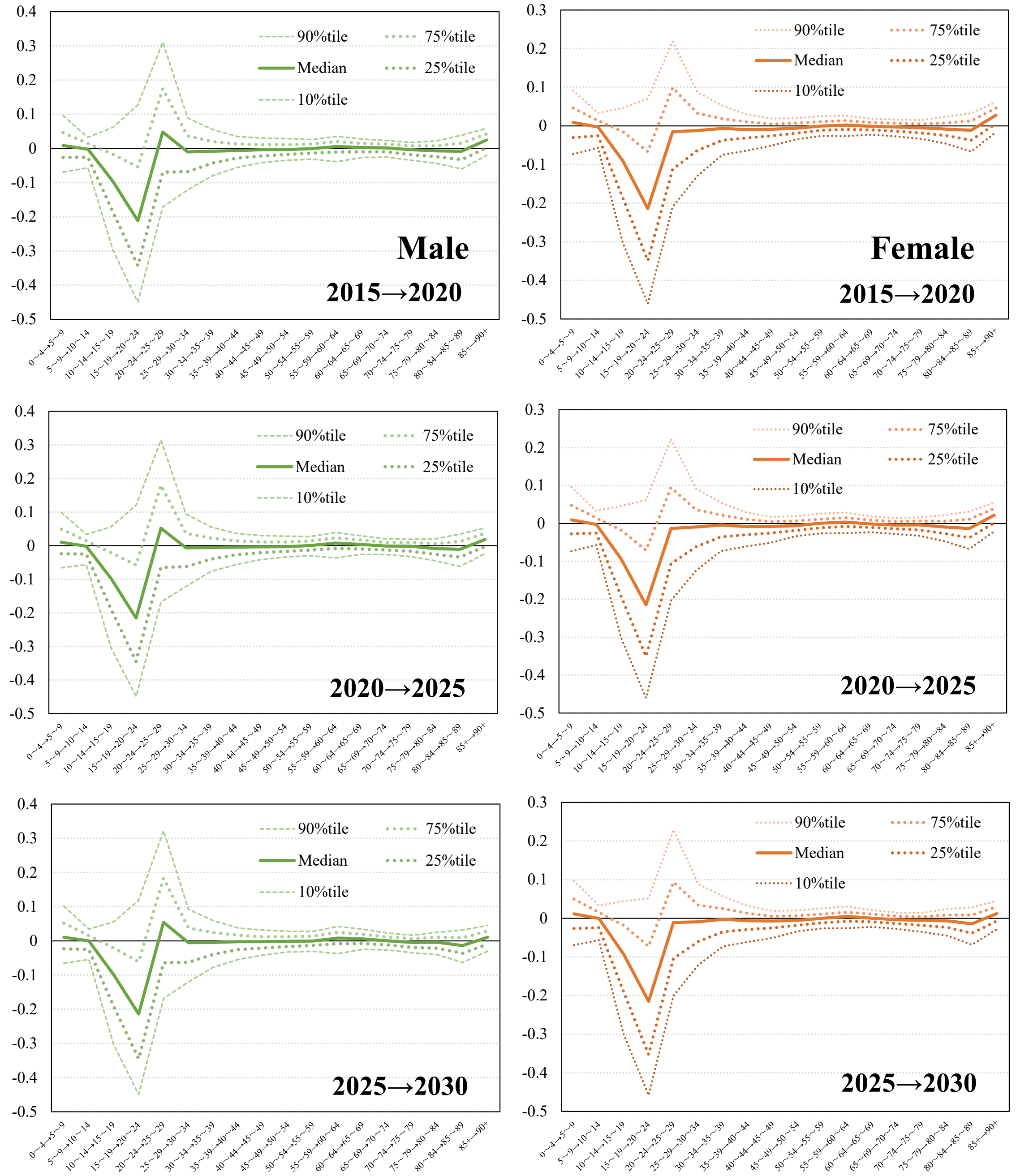


Figure 4 Distributions of age-specific net migration rates by sex:

2015→2020~2040→2045

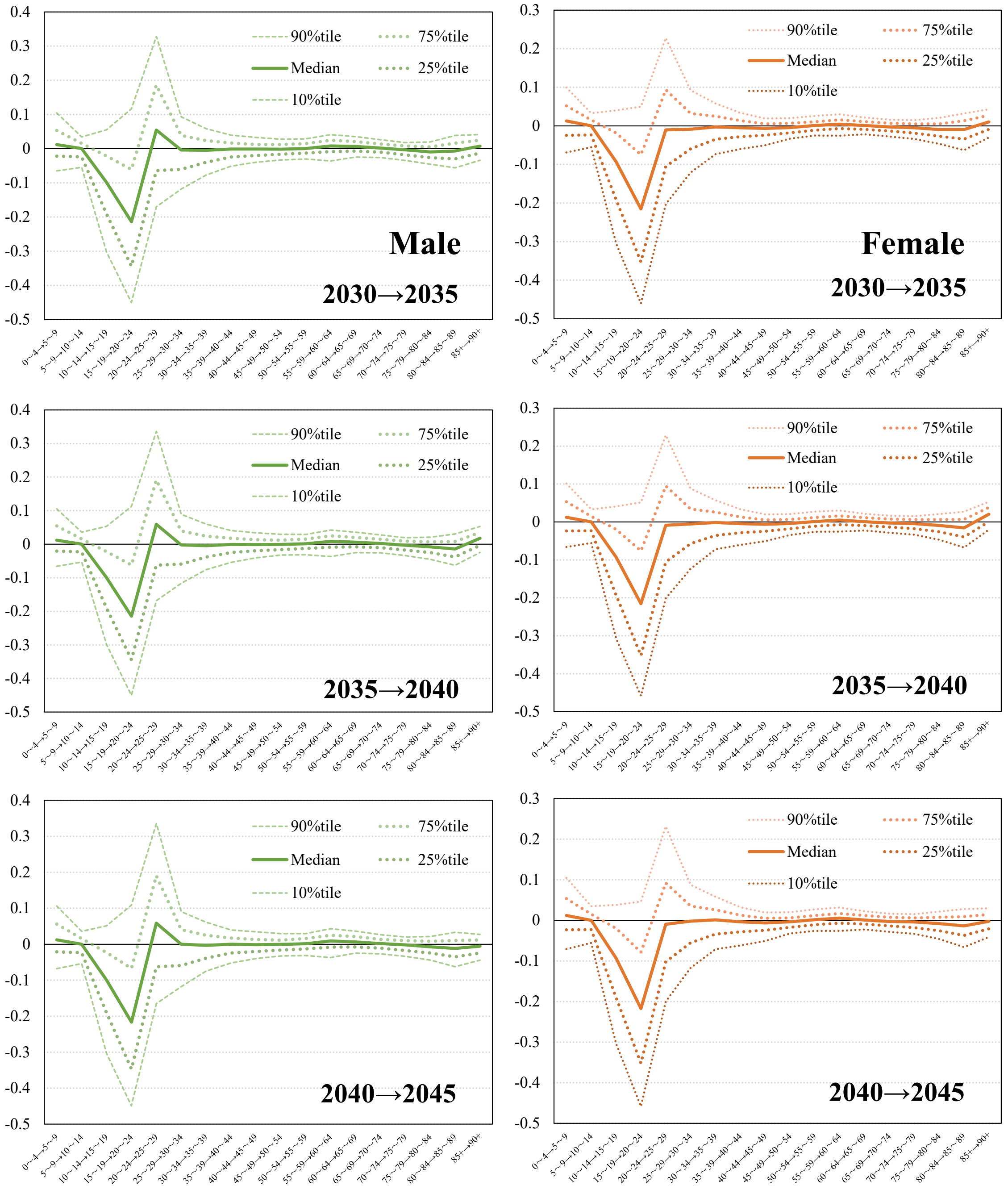


Figure 4 (continued)

Table 2 Population growth rate, contribution of each factor, and median difference between types of scenarios by population size as in 2015

(%)

	Total	Population size in 2015						
		less than 10,000	10,000-50,000	50,000-100,000	100,000-300,000	300,000-500,000	500,000-1,000,000	1,000,000 or more
Population Growth Rate and four factors under each assumption: 2015-2045								
Population Growth Rate								
RPP	-34.9	-49.4	-37.4	-26.2	-17.9	-9.5	-10.3	-7.5
Simulation I	-31.2	-47.8	-33.3	-19.6	-9.7	-1.6	1.5	8.7
Simulation II	-23.9	-38.2	-26.3	-14.6	-8.3	-3.5	-1.2	1.1
Momentum	-27.6	-36.2	-29.2	-22.7	-21.0	-20.3	-20.4	-19.3
Fertility								
RPP	-0.2	0.2	-0.1	-0.4	-0.6	-0.7	-0.6	-0.4
Simulation I･II	5.8	3.8	5.5	6.4	7.7	8.4	9.6	11.7
Mortality								
RPP	4.7	4.6	4.7	4.6	4.6	4.6	4.6	4.8
Simulation I･II	5.4	5.5	5.5	5.4	5.4	5.4	5.4	5.5
Migration								
RPP	-11.0	-16.9	-12.4	-6.1	-0.2	4.3	4.2	11.1
Simulation I	-13.6	-19.9	-15.1	-8.2	-1.4	3.7	4.7	13.5
Simulation II	-6.8	-10.9	-7.7	-4.2	-0.6	1.8	2.4	6.8
Difference between scenarios								
Population Growth Rate								
S-I - RPP	3.7	1.6	3.4	5.5	8.0	9.2	12.8	14.4
S-II - RPP	10.2	10.6	10.7	9.6	8.9	7.6	8.3	8.4
S-II - S-I	6.5	8.9	7.3	4.1	0.7	-1.9	-2.4	-6.9
Fertility: S-I･II - RPP	5.9	3.7	5.6	7.1	8.6	9.0	10.5	12.2
Mortality: S-I･II - RPP	0.8	0.8	0.8	0.7	0.7	0.7	0.7	0.7
Migration								
S-I - RPP	-2.0	-2.5	-2.4	-1.8	-1.0	-0.3	0.7	2.9
S-II - RPP	3.7	5.8	4.3	2.1	0.1	-2.1	-2.0	-3.5
S-II - S-I	6.5	8.9	7.3	4.1	0.7	-1.9	-2.4	-6.9
municipality (N)	1,682	479	668	257	196	47	24	11

Note: **RPP**: Regional Population Projections for Japan (2018), **S-I**: Simulation I, **S-II**: Simulation II

Table 3 Distribution of population growth rate from 2015 to 2045, by type of scenarios, by population size in 2015

(%)

	Total	Population size in 2015						
		less than 10,000	10,000-50,000	50,000-100,000	100,000-300,000	300,000-500,000	500,000-1,000,000	1,000,000 or more
1. Regional Population Projections for Japan (2018): 2015-2045								
less than -60%	5.8	18.2	1.6	0.0	0.0	0.0	0.0	0.0
-60～-40%	35.1	56.8	42.1	12.8	2.0	0.0	0.0	0.0
-40～-20%	33.0	19.0	37.7	47.9	41.3	14.9	4.2	0.0
-20～0%	20.5	5.0	14.2	30.7	43.4	78.7	70.8	72.7
0～5%	2.5	0.8	1.8	3.1	6.1	2.1	16.7	9.1
5～10%	1.4	0.0	0.9	2.7	4.1	0.0	4.2	18.2
10% or more	1.7	0.2	1.6	2.7	3.1	4.3	4.2	0.0
2-1. Simulation I: 2015-2045								
less than -60%	4.5	14.4	1.0	0.0	0.0	0.0	0.0	0.0
-60～-40%	29.8	55.3	32.9	5.8	0.5	0.0	0.0	0.0
-40～-20%	32.4	24.2	41.0	42.4	22.4	4.3	0.0	0.0
-20～0%	22.1	4.6	18.9	34.2	50.0	53.2	41.7	18.2
0～5%	3.4	1.0	2.8	5.1	5.1	12.8	16.7	9.1
5～10%	3.1	0.4	1.0	5.1	8.2	12.8	12.5	45.5
10% or more	4.7	0.0	2.2	7.4	13.8	17.0	29.2	27.3
2-2. Simulation II: 2015-2045								
less than -60%	0.8	2.7	0.0	0.0	0.0	0.0	0.0	0.0
-60～-40%	15.8	42.0	9.6	0.0	0.0	0.0	0.0	0.0
-40～-20%	41.8	43.6	57.3	33.9	12.2	0.0	0.0	0.0
-20～0%	31.7	10.2	27.2	51.0	63.8	66.0	54.2	18.2
0～5%	4.9	0.6	3.4	6.2	9.7	23.4	20.8	54.5
5～10%	2.1	0.2	1.0	5.4	5.1	2.1	4.2	9.1
10% or more	3.0	0.6	1.3	3.5	9.2	8.5	20.8	18.2
municipality (N)	1,682	479	668	257	196	47	24	11

Note: Each category is based on Jenks (Natural breaks).

Table 4 Comparison of population growth rates from 2015 to 2045 by population size in 2015 and between types of scenarios

(%)

	Total	Population size in 2015						
		less than 10,000	10,000-50,000	50,000-100,000	100,000-300,000	300,000-500,000	500,000-1,000,000	1,000,000 or more
RPP < S-I	91.9	82.3	93.3	97.7	99.5	100.0	100.0	100.0
RPP < S-II	97.7	98.7	97.0	97.3	98.0	97.9	100.0	100.0
S-I < S-II	82.8	97.3	90.3	75.5	56.1	29.8	16.7	9.1
municipality (N)	1,682	479	668	257	196	47	24	11

Note: **RPP**: Regional Population Projections for Japan (2018), **S-I**: Simulation I, **S-II**: Simulation II

Table 5 Distribution of contribution of age-structure factors by population size in 2015

(%)

	Total	Population size in 2015						
		less than 10,000	10,000-50,000	50,000-100,000	100,000-300,000	300,000-500,000	500,000-1,000,000	1,000,000 or more
less than -60%	0.5	1.7	0.0	0.0	0.0	0.0	0.0	0.0
-60～-40%	13.9	35.1	9.6	0.8	0.0	0.0	0.0	0.0
-40～-20%	61.2	51.8	70.8	59.5	57.7	53.2	54.2	45.5
-20～0%	23.1	10.9	18.1	37.4	41.3	46.8	45.8	54.5
0～5%	0.8	0.4	0.7	1.6	1.0	0.0	0.0	0.0
5～10%	0.2	0.2	0.3	0.4	0.0	0.0	0.0	0.0
10% or more	0.2	0.0	0.4	0.4	0.0	0.0	0.0	0.0
municipality (N)	1,682	479	668	257	196	47	24	11

Note: Each category is based on Jenks (Natural breaks).

Table 6 Distribution of contribution of fertility factors by population size in 2015

(%)

	Total	Population size in 2015						
		less than 10,000	10,000-50,000	50,000-100,000	100,000-300,000	300,000-500,000	500,000-1,000,000	1,000,000 or more
1. Regional Population Projections for Japan (2018): 2015-2045								
less than -3%	1.1	2.5	0.9	0.0	0.0	0.0	0.0	0.0
-3～-1%	17.4	14.2	14.2	27.6	23.0	21.3	16.7	0.0
-1～0%	39.2	27.1	36.8	43.6	57.1	68.1	70.8	90.9
0～2%	39.4	48.9	46.3	28.0	19.9	10.6	12.5	9.1
2～5%	2.9	7.1	1.8	0.8	0.0	0.0	0.0	0.0
5～10%	0.1	0.2	0.0	0.0	0.0	0.0	0.0	0.0
10% or more	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2. Simulation I・II: 2015-2045								
less than -3%	3.1	7.7	1.8	1.2	0.0	0.0	0.0	0.0
-3～-1%	2.2	5.0	1.6	0.8	0.0	0.0	0.0	0.0
-1～0%	2.5	5.0	2.5	0.0	0.5	0.0	0.0	0.0
0～2%	7.0	14.2	5.8	3.5	0.5	0.0	0.0	0.0
2～5%	27.2	31.9	32.0	25.3	12.2	2.1	0.0	0.0
5～10%	49.9	32.6	50.9	61.9	68.9	74.5	54.2	9.1
10% or more	8.2	3.5	5.2	7.4	17.9	23.4	45.8	90.9
municipality (N)	1,682	479	668	257	196	47	24	11

Note: Each category is based on Jenks (Natural breaks).

Table 7 Comparison of fertility factors by population size and between types of estimates, 2015

(%)

	Total	Population size in 2015						
		less than 10,000	10,000-50,000	50,000-100,000	100,000-300,000	300,000-500,000	500,000-1,000,000	1,000,000 or more
RPP < S-I・II	92.2	82.9	93.6	97.7	99.5	100.0	100.0	100.0
municipality (N)	1,682	479	668	257	196	47	24	11

Note: **RPP**: Regional Population Projections for Japan (2018), **S-I・II**: Simulation I and Simulation II

Table 8 Distribution of contribution of mortality factors by population size in 2015

(%)

	Total	Population size in 2015						
		less than 10,000	10,000-50,000	50,000-100,000	100,000-300,000	300,000-500,000	500,000-1,000,000	1,000,000 or more
1. Regional Population Projections for Japan (2018): 2015-2045								
less than 4%	1.5	2.1	1.2	1.9	0.5	2.1	0.0	0.0
4～5%	80.7	78.3	75.6	84.4	93.4	93.6	95.8	90.9
5～6%	17.4	19.0	22.5	13.6	6.1	4.3	4.2	9.1
6～7%	0.4	0.4	0.7	0.0	0.0	0.0	0.0	0.0
7% or more	0.1	0.2	0.0	0.0	0.0	0.0	0.0	0.0
2. Simulation I･II: 2015-2045								
less than 4%	0.1	0.2	0.1	0.0	0.0	0.0	0.0	0.0
4～5%	11.1	10.6	10.2	17.5	7.7	10.6	8.3	0.0
5～6%	78.7	75.8	76.9	77.4	88.8	89.4	91.7	90.9
6～7%	9.6	12.3	12.3	5.1	3.6	0.0	0.0	9.1
7% or more	0.5	1.0	0.4	0.0	0.0	0.0	0.0	0.0
municipality (N)	1,682	479	668	257	196	47	24	11

Note: Each category is based on Jenks (Natural breaks).

Table 9 Comparison of mortality factors by population size and between types of scenarios, 2015

(%)

	Total	Population size in 2015						
		less than 10,000	10,000-50,000	50,000-100,000	100,000-300,000	300,000-500,000	500,000-1,000,000	1,000,000 or more
RPP < S-I･II	99.9	99.8	100.0	100.0	100.0	100.0	100.0	100.0
municipality (N)	1,682	479	668	257	196	47	24	11

Note: **RPP**: Regional Population Projections for Japan (2018), **S-I･II**: Simulation I and Simulation II

Table 10 Distribution of the contribution of migration factors by population size in 2015

(%)

	Total	Population size in 2015						
		less than 10,000	10,000- 50,000	50,000- 100,000	100,000- 300,000	300,000- 500,000	500,000- 1,000,000	1,000,000 or more
1. Regional Population Projections for Japan (2018): 2015-2045								
less than -20%	16.1	36.3	14.4	0.4	0.0	0.0	0.0	0.0
-20～-10%	37.7	45.7	45.4	36.2	9.7	0.0	0.0	0.0
-10～0%	26.2	14.4	28.1	34.2	41.3	27.7	4.2	9.1
0～5%	9.9	2.5	7.0	15.6	20.9	27.7	50.0	9.1
5～10%	5.2	0.6	3.0	7.4	14.8	21.3	12.5	27.3
10～15%	2.4	0.4	1.3	3.5	5.1	10.6	8.3	27.3
15% or more	2.6	0.0	0.7	2.7	8.2	12.8	25.0	27.3
2-1. Simulation I: 2015-2045								
less than -20%	26.3	49.5	27.8	6.2	1.5	0.0	0.0	0.0
-20～-10%	34.4	34.9	41.6	39.3	16.8	0.0	0.0	0.0
-10～0%	21.2	12.3	20.5	27.6	36.7	29.8	12.5	9.1
0～5%	8.3	2.3	5.4	14.0	17.3	25.5	37.5	9.1
5～10%	4.2	0.4	2.2	6.6	11.2	19.1	16.7	9.1
10～15%	2.4	0.6	1.8	3.1	4.1	8.5	8.3	27.3
15% or more	3.3	0.0	0.6	3.1	12.2	17.0	25.0	45.5
2-2. Simulation II: 2015-2045								
less than -20%	0.8	2.5	0.1	0.0	0.0	0.0	0.0	0.0
-20～-10%	29.8	54.7	32.2	7.4	3.1	0.0	0.0	0.0
-10～0%	50.0	37.6	56.4	64.2	51.5	29.8	12.5	9.1
0～5%	13.4	3.8	8.8	21.4	29.1	44.7	54.2	27.3
5～10%	3.7	0.6	2.2	5.4	8.7	12.8	12.5	45.5
10～15%	0.9	0.0	0.1	1.2	3.1	4.3	4.2	18.2
15% or more	1.3	0.8	0.0	0.4	4.6	8.5	16.7	0.0
municipality (N)	1,682	479	668	257	196	47	24	11

Note: Each category is based on Jenks (Natural breaks).

Table 11 Comparison of migration factors by population size and between types of scenarios, 2015

(%)

	Total	Population size in 2015						
		less than 10,000	10,000- 50,000	50,000- 100,000	100,000- 300,000	300,000- 500,000	500,000- 1,000,000	1,000,000 or more
RPP < S-I	13.3	12.7	5.2	10.1	29.6	38.3	62.5	90.9
RPP < S-II	78.6	95.4	86.1	67.3	52.6	21.3	12.5	9.1
S-I < S-II	82.8	97.3	90.3	75.5	56.1	29.8	16.7	9.1
municipality (N)	1,682	479	668	257	196	47	24	11

Note: **RPP**: Regional Population Projections for Japan (2018), **S-I**: Simulation I, **S-II**: Simulation II

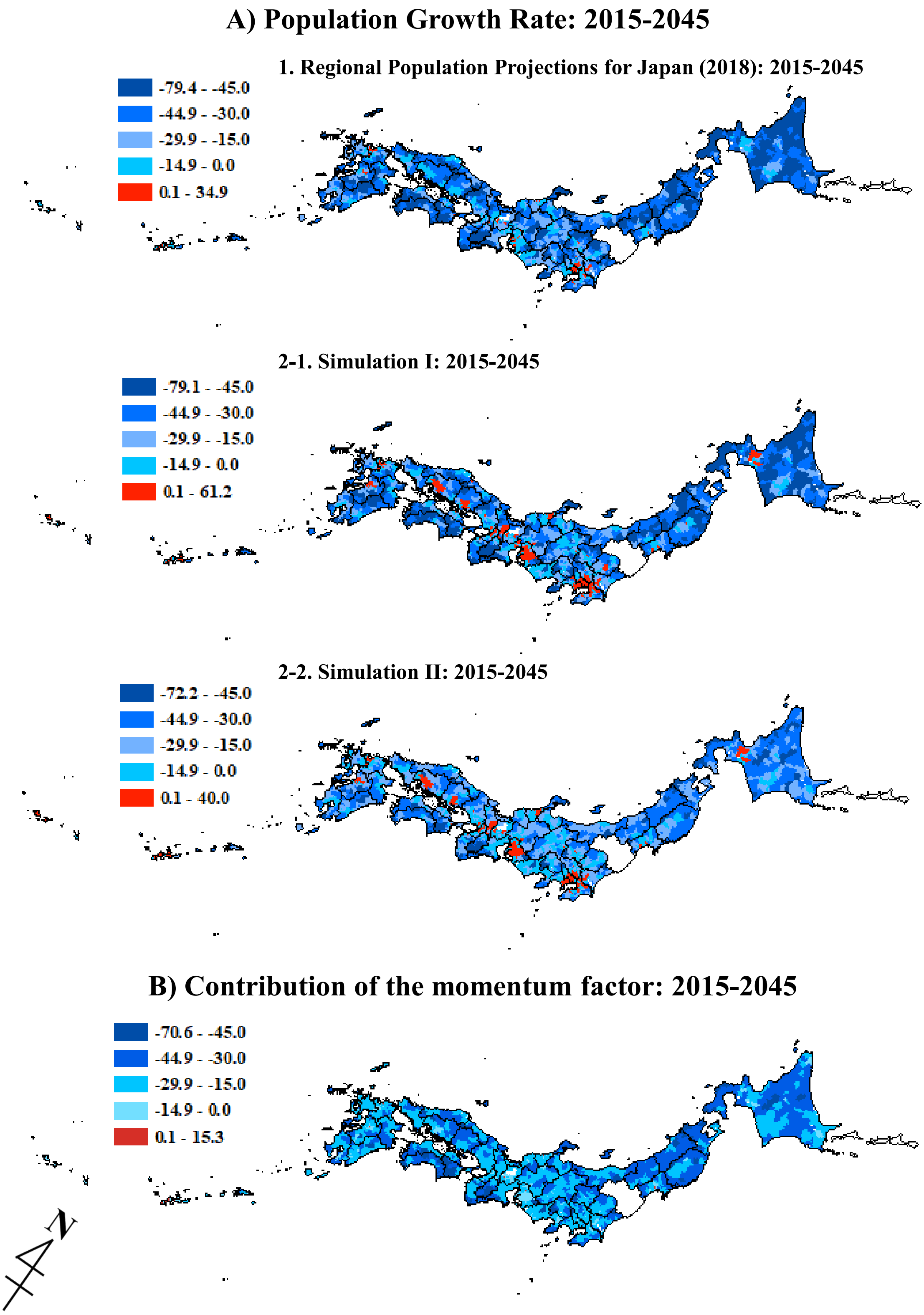
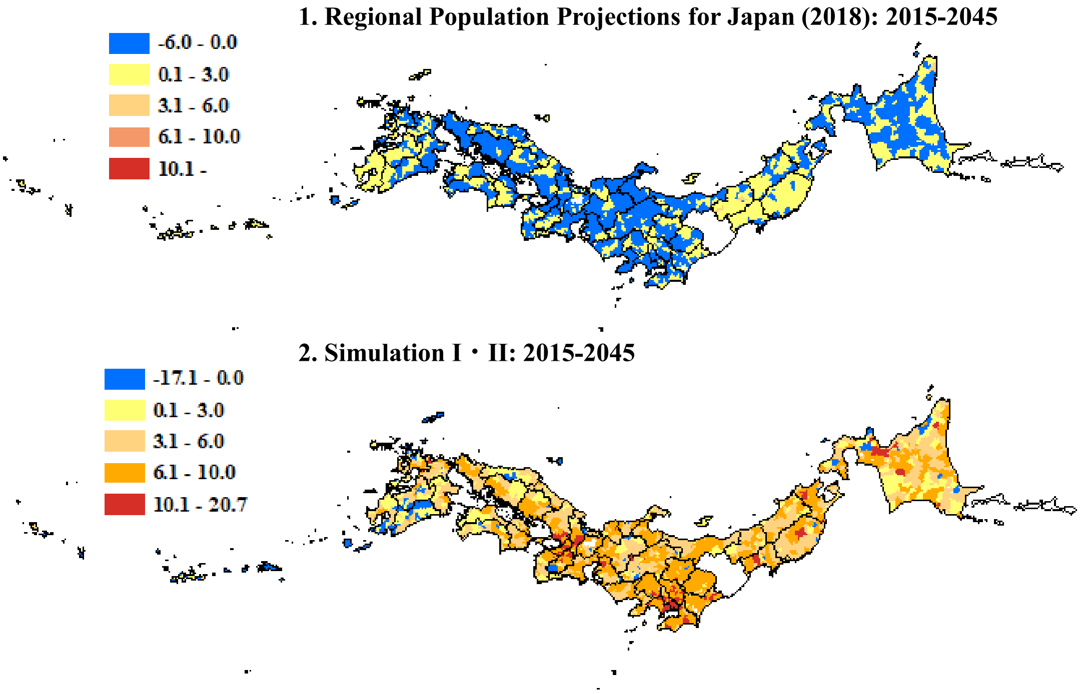


Figure 5 The geographic distribution of population growth rate and each factor from 2015 to 2045

C) Contribution of the Fertility factor: 2015-2045



D) Contribution of the Mortality factor: 2015-2045

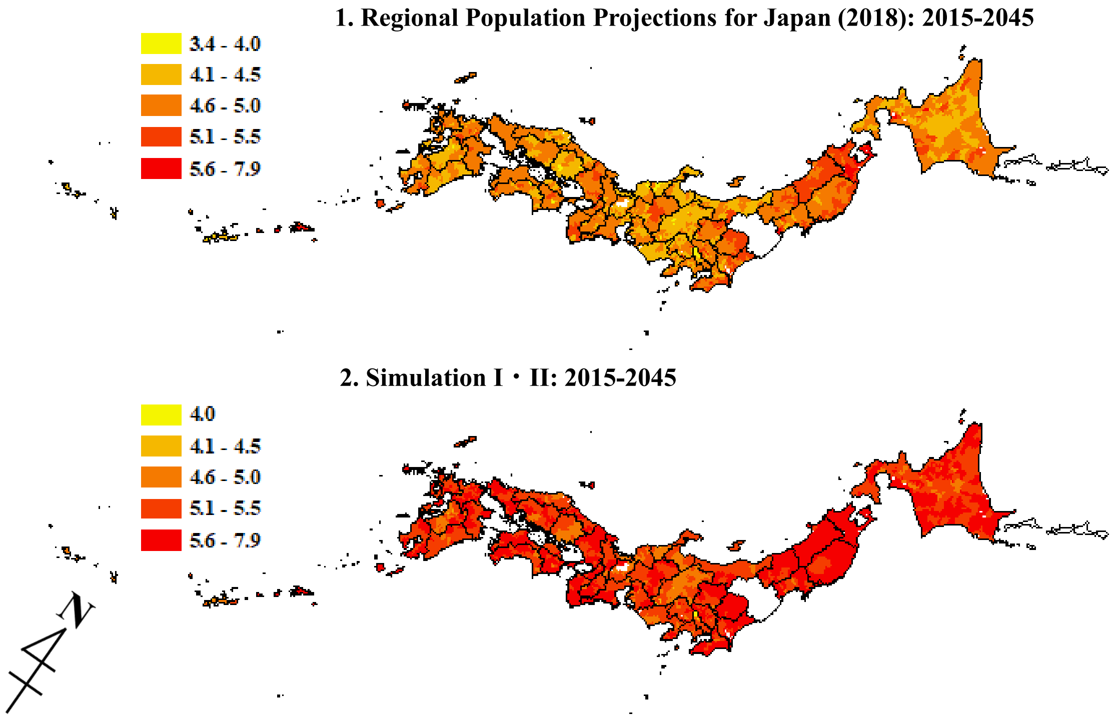


Figure 5 (continued)

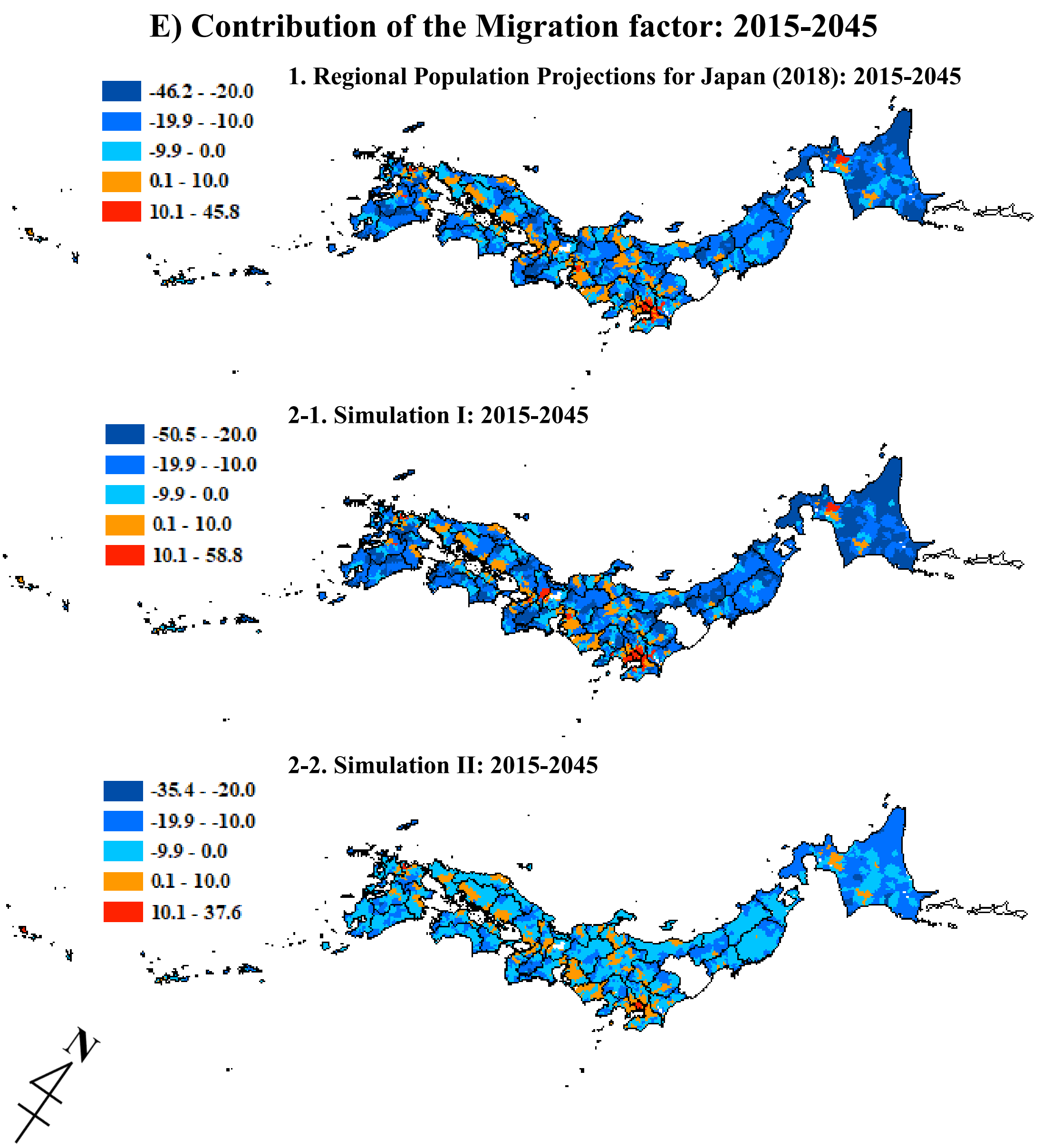


Figure 5 (continued)