The Effects of Aging Population on Regional Economy and Electricity Demand
－ Longer-term Simulation Analysis to 2050 －

Background

Due to the aging population and the falling birthrate, the Japanese labor force (ages 15-64) is already starting to decrease since 1997 and the total population is projected to decrease from 2006. The change in population structure differs greatly by region, and the effect of population decrease on regional economy and electricity demand is becoming a pressing issue.

Objectives

In this research, the regional growth model is currently developed in addition to our previously developed regional demographic model. Using our models, the effects of population change on regional economies and electricity demand are numerically obtained. The increases in birthrate and labor participation rates of females and elderly people are also analyzed in the sensitivity analysis.

Principal Results

1. The previously developed demographic model is modified to derive the number of households and migration rate by age groups. The supply side economic model is also developed to estimate the effect of aging society in regional economies using our private and public capital stock and employment data.

2. The outcomes of simulation analysis are as follows.

(1) Base case

The labor force and private investment are projected to decrease due to the aging society. The regional GDP will therefore decrease around 2011 in Hokkaido to 2036 in Okinawa if the fertility and employment rates are status quo. The average growth rate of national GDP would be 0.4% annually that is much lower than before. GDP will decrease from 2021 at 548 Trillion yen. (Figure1, Table1)

The peak year of regional electricity demand come 1 to 10 years behind the peak years of regional GDP. The peak year of residential electricity demand vary from 2020 in Hokkaido and Shikoku to 2042 in Okinawa. The industrial electricity demand starts to decrease from 2020 in Hokkaido and Shikoku. (Table 1). The peak year of residential utility is later than industrial electricity because there is increasing demand effect of increase in elderly people. Elderly people stay more time in their homes than any other generation.

(2) Case for increase in birthrate and labor participation rate

The case of rise in total fertility rate and labor participation rate for female and elderly people postpones the peak years of GDP and electricity demand. Comparing the results with those of base case, the GDP and electricity demand decrease is slower. The peak value of national GDP of simulation case is higher than the base case. Our results indicate that the policy of counter aging population has a certain effect on shrinking regional economies (Figure 2).

(3) Case for productivity increase

The increase in productivity in terms of TFP due to the policies such as technological progress and revitalization of regional economy has a strong effect on economy. If the TFP increase 1% every year, the regional GDP and electricity demand will not decrease until 2050. The average growth rate becomes 1.3% for 2000-2025 and 0.5% for 2025-2050. The national GDP reaches 775 trillion yen and total electricity demand will be 1594.2 TWh in 2050.

Future Developments

Using our results of population forecasts, the economic and electricity demand will be forecasted. The demographic analysis could be enhanced by integrating the consumption and regional population models.
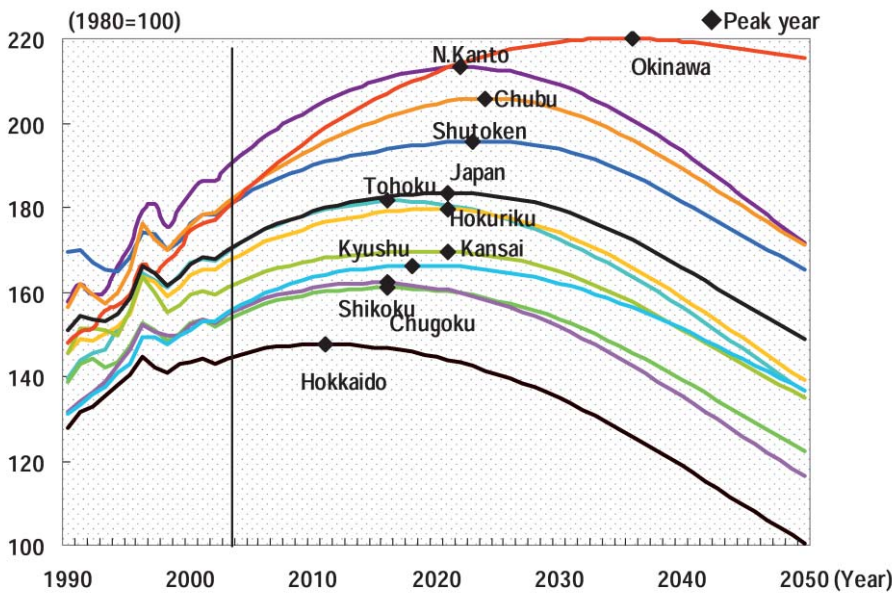
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Reference
Yamano and Sakurai, 2004, "The effects of Aging Population on Regional Economy and Electricity Demand —Longer-term Simulation Analysis to 2050—," CRIEPI Report No. Y03018 (in Japanese)

Fig.1 Regional GDP

Regional GDP will decrease from 2011 to 2036 corresponding to the aging population. The national GDP is projected to be as low as 0.4% growth rate in 2000-2025. GDP growth rate turns into negative in 2021 at 548 Trillion Yen.
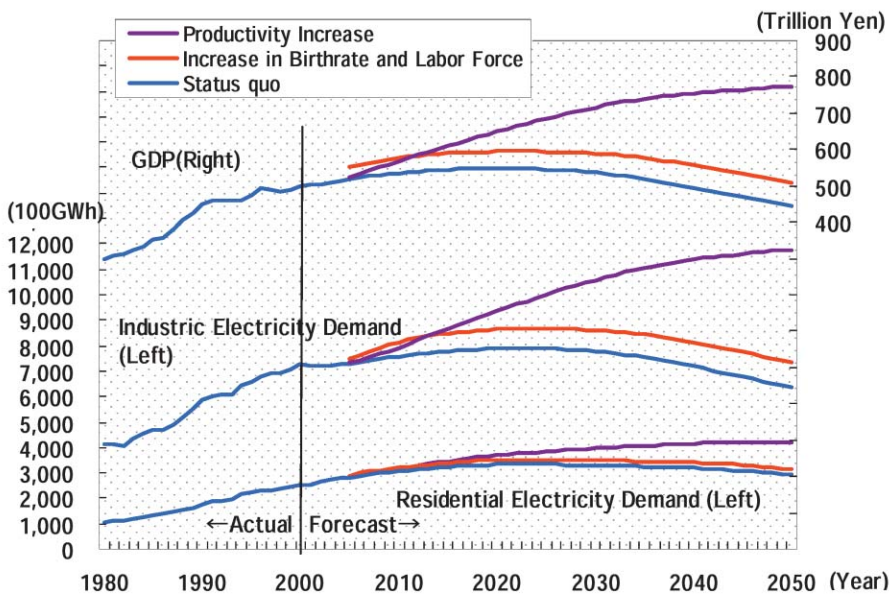
Fig.2 Regional GDP and Electricity Demand of Household and Industry (JAPAN)

The certain economic effect was confirmed in the numerical simulation that assumes the increase in birthrate and labor force. The national GDP and electricity demand will not decrease until 2050, if productivity increases 1% every year.

Table 1 Regional GDP

		Hokkaido	Tohoku	N.Kanto	Shutoken	Chubu	Hokuriku	Kansai	Chugoku	Shikoku	Kyushu	Okinawa	JAPAN
GDP (Trillion Yen, 1990 price)	2000	19.0	43.1	31.0	152.1	70.8	12.2	81.6	28.3	13.5	42.5	3.3	497.4
	2025	18.6	45.9	35.9	168.8	82.8	13.2	86.0	29.3	13.9	46.4	4.1	545.1
	2050	13.3	35.2	29.0	142.8	68.9	10.3	69.0	22.7	10.3	38.4	4.1	444.0
	2000~25*	-0.1%	0.3%	0.6%	0.4%	0.6%	0.3%	0.2%	0.1%	0.1%	0.4%	0.9%	0.4%
	2025~50*	-1.3%	-1.1%	-0.9%	-0.7%	-0.7%	-1.0%	-0.9%	-1.0%	-1.2%	-0.7%	0.0%	-0.8%
	Peak value	19.6	46.9	36.1	169.0	82.9	13.3	86.7	29.9	14.4	46.8	4.2	548.1
	[peak year]	[2011]	[2016]	[2022]	[2023]	[2024]	[2021]	[2021]	[2016]	[2016]	[2018]	[2036]	[2021]
Total Electricity Demand (100million kWh)	2000	360	847	741	2,334	1,508	285	1,582	829	356	909	69	9,821
	2025	372	917	888	2,786	1,843	319	1,743	869	387	1,002	92	11,217
	2050	270	708	726	2,428	1,562	252	1,424	673	286	839	94	9,262
	2000~25*	0.1%	0.3%	0.7%	0.7%	0.8%	0.5%	0.4%	0.2%	0.3%	0.4%	1.2%	0.5%
	2025~50*	-1.3%	-1.0%	-0.8%	-0.5%	-0.7%	-0.9%	-0.8%	-1.0%	-1.2%	-0.7%	0.1%	-0.8%
	Peak value	382	927	888	2,787	1,844	320	1,751	879	394	1,005	95	11,238
	[peak year]	[2017]	[2021]	[2024]	[2026]	[2027]	[2022]	[2021]	[2019]	[2018]	[2022]	[2041]	[2022]

＊：Annual average growth rate