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Original Paper

Economic consequences of anti-aging

Masahiko Takeda

Australian National University, Acton, Australia

Abstract

Usefulness of anti-aging medicine cannot be judged solely by its contribution to our healthy life expectancy. It is of limited use if we cannot live our longer healthy life happily and comfortably, and for this, we need a social and economic environment that is suitable for longer-living individuals. This idea was implied by Yonei (2021), when he argued that we should build a "healthy society". Anti-aging medicine's success will accelerate the increase of "old-age dependency ratio", which is already very high in Japan. An aging population poses a number of serious economic and economic-policy challenges, and unless we handle them well, we will not be able to build a "healthy society". We therefore review the state of population aging in Japan, examine how the elderly live their lives now and in the future, and discuss economic policy issues that need to be addressed to help the Japanese economy adjust to aging.

One of the most salient issues in this regard is how to re-design social welfare programs, since there will be an increasing number of the elderly poor in the future. Yonei (2021) makes an interesting proposal, which he calls "rice-sic income", that combines the provision of "basic income" for the poor with a policy for revitalizing agriculture in Japan. We evaluate this proposal from the point of view of standard economics.

KEY WORDS: population aging, old-age dependency ratio, public pension, labor participation, social welfare, basic income

Introduction

Anti-aging medicine primarily deals with how to extend our healthy life expectancy. However, Yonei Y (2021)¹⁾ argues that in order to achieve the goal of antiaging, it is necessary that not only our physical and mental health is elongated, but also that we are kept "socially and economically healthy". And he argues that we should aim at building a "healthy society" consisting of physically and mentally healthy individuals.

As researcher specializing in economics and economic policy, I fully agree with Yonei's argument. In view of the already high and rising share of the elderly in Japan's population²⁾, how this trend of aging affects Japan socially and economically is a very important and challenging question. Anti-aging medicine contributes to this trend, so unless Japan can skillfully handle various social and economic problems that may arise from population aging, there is no guarantee that anti-aging medicine's success in extending our life will lead to our increased happiness and sense of fulfillment. Without the latter, anti-aging medicine's usefulness may even become questionable.

In light of this, we review economic challenges being

posed by population aging in Japan, and discuss what is needed to overcome these challenges. After that, from the viewpoint of economics, we examine the specific policy measure Yonei¹⁾ proposes as a way to build a "healthy society" --- what he calls "rice-sic income"^{*1} --- a version of universal basic income that combines revitalization of Japan's agriculture and public support for the poor.

***1** The Japanese word for "rice" can be pronounced "beh-i". Hence, "rice-sic income", if the "rice" is replaced by the Japanese word for it, has the same pronunciation as "basic income".

The Prospects for Population Aging in Japan

Anti-aging medicine is not just about the elderly. For example, if those in their forties and fifties are able to maintain the health and vitality of their twenties, it is unquestionably an anti-aging achievement. However, if such achievements add up to longer healthy life expectancy, the general life expectancy will become longer as well and population aging will accelerate.

The so-called "old-age dependency ratio" is given by dividing the population above 65 by the working age population between 15 and 65. This ratio was around 10% in Japan in the 1960s but reached 48% in 2020 (*Fig. 1*)³). The ratio's world average is 14%, that of advanced economies where aging is relatively advanced is 29%, and next to Japan are Finland and Italy with 37%. Therefore, Japan's ratio is the highest in the world by a wide margin³). According to the National Institute of Population and Social Security Research's quintennial population projection (the latest published in 2017)⁴, the ratio will continue to rise, reaching close to 75% by 2050 (*Fig. 2*).

In *Fig. 2*, the birth and mortality rates are assumed to be

"medium". Under the "medium" mortality rate assumption, the life expectancy that was 80.75 years for male and 86.98 years for female in 2015 is assumed to be 83.27 and 89.63 in 2040, and 84.95 and 91.35 in 2065, respectively⁴). The National Institute also produces projections under "high" and "low" birth and mortality rates. If the mortality rate is assumed to be "low", under which the life expectancy is 84.15 for male and 90.54 for female in 2040 and 86.05 and 92.48 in 2065, respectively, the old-age dependency ratio will be higher by about 2 percentage points in 2040, and by about 3 percentage points in 2065. This increase is due to a roughly one-year increase in the life expectancy by 2065 relative to the "medium" mortality rate baseline. If the life expectancy rises further thanks to anti-aging medicine, the ratio's increase will be larger.



Fig. 1. Old age dependency ratio (%) from 1960 to 2020.

The figure quoted from World Bank Data (Ref. 3).



Fig. 2. Projected old-age dependency ratio (%).

Projected old-age dependency ratios are prepared by the author based on the midpoint assumptions of births and deaths from the report of National Institute of Population and Social Security Research (Ref. 4).

How do the elderly support themselves economically?

The word "dependency" in the old-age dependency ratio implies that those above 65 years of age are dependent on the working age population. If the elderly are indeed dependent and the dependency ratio is to rise above 70%, the valueadded produced by the working age population needs to be dramatically higher, so that there are enough resources to be transferred to the elderly^{**}. However, the value-added per hour worked has only been rising very slowly over the past decades in Japan, and its dramatic acceleration is not expected in the future.

Still, it is not the case that the elderly in Japan live dependent on younger generations. To see this, we refer to the Ministry of Health, Labor and Welfare's "Comprehensive Survey of Living Conditions"⁵⁾. This annual survey is conducted on a larger scale every three years, and the latest large-scale survey that we cite here was in 2019. Therefore, COVID-19's impact is not yet felt in the survey.

According to this survey, the economic life of the elderly has the following characteristics:

1) An increasing number of the elderly (65 or above) live apart from their children and grandchildren (*Fig. 3*). As a result, more of the elderly are probably paying their living expenses such as food, housing, and utility out of their own pockets.

2) The average annual income of elderly households 33 is 3.1 million yen, which is less than half of the other

households' average annual income. 64% of their income come from "public pension", 23% from "earned income" **4, and 7% from "returns on assets". Hence, the elderly earn 30% of their income on their own, but their dependence on pension is significant.

3) The elderly households that depend 100% on public pension as their income source are 48%, and those that depend more than 80% on it are 13%, of the total. The fact that the elderly earn 30% of their income is true only on average, and a majority of elderly households earn no income or less than 20% of their income from work or assets.

4) The elderly households' average savings are 12.8 million yen, and their borrowing is 1.2 million yen. To a survey question regarding changes in savings, 43% of the elderly responded that they declined. The reasons cited were mostly household expenses of one type or another.

As can be seen from 3) above, average numbers can mask important details. The same is true with the elderly's savings in 4). Since the Ministry's report on the results of the survey does not include any information about the distribution of savings among households, we supplement this aspect referring to the "Public Opinion Survey on Household Financial Assets and Liabilities" conducted in 2020 by the Central Council for Financial Services Information⁶⁾. According to this survey, the elderly households' financial asset holdings are as shown in *Table 1* below.

Some elderly households hold a very large amount of financial assets, which raises the mean and drives a sizable wedge between the mean and the median. The median

	Single- person households	Married couple households	Houser elderly unmarr	nolds with the and ied young	Three genera house	- ation holds		Other househol	ds
1986	13.1	18.2	11.1		44.8			12.7	
1989	14.8	20.9		11.7	4	0.7		11.9	
1992	15.7	22.8		12.1		36.6		12.8	
1995	17.3	2	4.2	12.9		33.3		12.2	
1998	18.4		26.7	13.7		29.7		11.6	
2001	19.4		27.8	15.	.7	25.	5	11.6	
2004	20.9		29.4		16.4	2	1.9	11.4	
2007	22.5		29.8		17.7		18.3	11.7	
2010	24.2		29.	9	18.5		16.2	11.2	
2013	25.6		3	1.1	19	.8	13.2	10.4	
2016	27.1			31.1		20.7	11.0	10.0	
2017	26.4			32.5		19.9	11.0	10.2	
2018	27.4			32.3		20.5	10.0	9.8	
2019	28.	8		32.3		20.0	9.4	9.5	
	0 10	20	30 40	0 50	60	70	80	90	100%

Fig. 3. Structure of the elderly households.

Values for 1995 exclude data for Hyogo Prefecture. Values for 2016 exclude data for Kumamoto Prefecture. "Households with the elderly and unmarried young" includes "households of a married couple and unmarried children" and "households of a single parent and unmarried children". The figure quoted from 2019 Comprehensive Survey of Living Conditions, Figure 2, by Ministry of Health, Labor and Welfare (Ref. 5).

Table 1. The	e elderly's	financial	asset ho	ldings in	10,000 yen
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	Head of household's age	Mean	Median
Households with	60's	1,745	875
two or more persons	70 or above	1,786	1,000
Single-person households	60's	1,305	300

Source: Central Council for Financial Services Information, "Public Opinion Survey on Household Financial Assets and Liabilities", 2020.

numbers in *Table 1* imply that one half of the surveyed elderly households own financial assets of this much or less.

*2 The overall dependency ratio that includes population under 15 in the numerator is expected to reach 95% by the mid-21st century. Therefore, the burden to be put on the working age population will be even heavier.
*3 The "elderly household" is a household that consists only of the elderly (65 years old or older), or a household with the elderly and the unmarried young (younger than 18).

****4** "Earned income" includes wages, business profits, income from agriculture and animal husbandry, and income from cottage work.

How can we assess the elderly's economic conditions?

We have seen the elderly's income and their savings and financial asset holdings that can supplement their income if needed. To assess their economic conditions, we need to know; their spending needs; to what extent these needs are being covered by their income; and if there is a shortfall, whether they have sufficient assets to cover the gap for the rest of their life. And in the end, we need to ask if the spending they can afford is enough for them to live happily and comfortably.

However, a problem that we encounter in this assessment is that there is no way of determining how much spending is needed for a happy and comfortable life. It is possible to check the data and find how much spending is being done by the elderly and how much of their savings is being used to cover the gap. This was done by a working group of the government-sponsored Financial System Council. In its report published in 2019⁷, the working group estimated that the monthly income-spending gap of a typical elderly couple was about 50,000 yen, and argued that to finance this gap for 20-30 years, the couple needed financial assets of 13-20 million yen.

This report⁷⁾ analyzed various aspects of asset holdings and management in an aging society, and made useful suggestions and recommendations. And the estimated need for asset holding of 13-20 million yen was just a very small part of the report. However, the number "20 million yen" triggered a strong political reaction, which resulted in the government's unprecedented refusal to accept this report.

The reason why the issue became so politicized was because the use of a "typical" household was seen to be misleading. Each household's spending depends a lot on its specific circumstances. For example, its spending needs are affected by whether it owns or rents a house, health conditions of household members (the different need for medical and old-age care expenses), and the household's location (different costs of living between big cities and rural areas). Also, how much spending is enough to live a happy and satisfactory life is subjective. If we want luxury, no amount of savings is enough, while if we are satisfied with life we can afford with our pension, there is no need for large savings. In the end, one can say happiness comes from within, and not from money we own or goods we buy.



Fig. 4. How the survey participants describe their life.

Values for 2016 exclude data for Kumamoto Prefecture. Parenthesis [] shows values in 2016. The figure quoted from 2019 Comprehensive Survey of Living Conditions, Figure 16, by Ministry of Health, Labor and Welfare (Ref. 5).

But there is a clue in the Living Conditions survey ⁵) that helps us assess the elderly's economic happiness and comfort. It asks how the survey participants describe their life, and their answers are shown in *Fig. 4*. About half of the elderly responded "very hard" or "somewhat hard", which is a worrisome result. But the share in the elderly of those feeling hardship is slightly lower than the share in all households, so it is not the case that the elderly are put in a particularly difficult situation.

Another clue is found in a survey conducted by a lifeinsurance company (MetLife (2021))⁸). When asked what worries them most about their old age, 60-70% of the respondents in their 20's through 50's cited "money", and this was the highest share among the candidates for the source of concern^{*5}. However, only about 45% of the respondents in their 60's and 70's chose "money", and this share was no. 4 after "health", "dementia", and "care of oneself".

In light of these, we may be able to conclude that at least at present, the living conditions of the elderly are not "very hard", and the main target of economic policy should be some other groups, such as fatherless families whose difficulties are clearly indicated in *Fig. 4*. If we take COVID-19's adverse impact into account, pensioners are relatively less affected. The hardest hit are those without permanent employment and service firms whose business has been seriously undermined by the restricted movement of people. Public support should be directed to these individuals and firms for the time being.

*5 Multiple answers are allowed, so other sources of concern are also chosen by the respondents.

Economic policy issues brought to the fore by population aging

The assessment made above is likely to change substantially in the future. The financial foundation of public pension that accounts for a large part of the elderly's income is weak, and the amount the future elderly can receive is expected to dwindle. To minimize this dwindling while avoiding excessive increases in the working age population's burden in the form of their contributions to the pension system, financial support from the national budget has to increase. This would be fine if the national budget was sound and capable of covering the funding gap that is expected to be very large and last for a long time. But Japan's public finances are the polar opposite of this, being the worst in the world^{*6}. How to cope with this ever worsening fiscal condition is a grave policy challenge that will affect not just the elderly but the entire population. Unfortunately, however, no effective counter-measures are being implemented, and are not even anywhere in sight.

If we cannot count on pension receipts in the future, we will have to continue working after 65, or save more when young to prepare for our life after retirement. Of these, the tendency of the elderly to continue to work is already clearly visible (*Fig. 5*). Keeping in touch with the society through continued work is likely to be desirable for the elderly's mental and physical health. Also, utilizing the elderly labor force helps slow down the expected contraction of Japan's potential output to be caused by the steadily shrinking working age population. This is desirable from a macroeconomic point of view *7. Therefore, policies that



Fig. 5. The workforce population ratio.

The workforce population ratio is the sum of workers and the unemployed divided by the total population of each age group. The reason the unemployed is included in the numerator is because the unemployed is defined to be "ready to work and seeking a job or preparing to start a business". The figure quoted from Annual Report on the Aging Society, Figure 1-2-1-11 by Cabinet Office (Ref. 2).

support the elderly's participation in the labor market should be promoted as the government's top priority.

If these policies succeed in facilitating the elderly's labor participation, there still remains a number of serious problems. First, even if the elderly's healthy life expectancy is extended thanks to anti-aging medicine, a certain period of not-so-healthy life will be unavoidable. Then, as the number of the elderly steadily increases, so will be the need for medical and old-age care. On the other hand, Japan's working age population will shrink over the next several decades, much more rapidly than any increase in the elderly's labor participation can offset. As a result, we are bound to see a chronic and serious shortage of care workers. To ease this, and also to meet labor demand in other areas of work, there is no effective way other than to substantially increase the number of foreign workers^{**8}.

In utilizing more foreign workers, we should be aware that we do not import labor service just as we import goods; rather, we should aim at receiving human beings. This is not just a humanitarian consideration. We benefit more from foreign workers by integrating them as citizens. For example, foreigners who come to Japan to work for a limited period of time strive to maximize the amount of money they take back home, so they spend as little as possible during their stay. But those who come to Japan to settle down will spend money in Japan as Japanese do, and thus contribute not only to the economy's production but also to aggregate demand.

In order to slow down the rapid transition of Japan's population toward an elderly-heavy structure, we need a major policy change from labor import to immigration, so that workers from abroad settle down in Japan and become a part of our society and economy. This is no easy task politically, but we see no way around it. Second, even if working opportunities increase for the elderly in the future, many elderly people will not be able to continue working for various reasons. Even if they do, they may not be able to earn enough income to satisfy their basic economic needs. Moreover, the record of pension premium payment shows that more than 10 % of all pension members (about 7 million individuals) are either "fully exempt from premium payment or premium obligation suspended" or "failure to pay premium"⁹⁾. When old, these individuals will receive no pension or have their pension reduced. For these reasons, it is likely that there will be an increasing number of the elderly poor in the future.

Public support for the poor is provided through social welfare programs^{**9}. The programs are not just for the elderly, but the elderly households' number and share are rapidly rising among social welfare recipients, and they now account for more than half of the households covered by social welfare (*Fig.* 6)¹⁰). Therefore, as Japan's population ages further, there may be a need to revamp social welfare programs. Against this background, let us discuss the "rice-sic" income idea proposed by Yonei (2021)¹).

6 Japan's public debt-GDP ratio is 240%, and its world no.1 status is even more definitive than in the ranking of the old-age dependency ratio.
7 Slowing down macroeconomic shrinkage slows down the erosion of tax base as well. This is important to ameliorate the worsening of public finances.

****8** Measures to stop and reverse the declining birth rate are so far not bearing visible fruit, and even if they succeed, it is decades from now that we see its impact on the labor market. We do not deny the importance of these measures, but one cannot count on it as a solution to the problem of labor shortage.

*9 In addition to social welfare programs, unemployment insurance provides relief for difficulties due to job loss. However, its relevance for the elderly is probably less than social welfare.



Fig. 6. The number of elderly households under welfare programs and their share in the total households covered by the programs.

The number of elderly households (1.h.s. in 10,000). The share of elderly households (r.h.s. in %). The figure prepared by the author based on Public assistance recipients survey by Ministry of Health, Labor and Welfare (Ref. 10).

What is "basic income"?

There are several requirements for social welfare programs. First, they should deliver necessary support to those who need it. This requirement implies that they do not deliver to those who do not need support, which is important to economize on limited fiscal resources. Second, they should minimize the cost of administration. If this cost is large, resources that can be used for the poor are diverted and the objective of public support is undermined. Third, they should contain a mechanism that encourages support recipients to stand on their feet. Public support must be a temporary help available only until the recipients can live their life without it. Designing programs that satisfy these three requirements is not easy. In particular, there is a tradeoff between the first and second requirement, because a careful check of who does or does not qualify for public support raises administrative costs.

"Basic income" is a dramatically different approach to public support. It provides a certain amount of money to all individuals, young or old, with no eligibility condition attached and on an ongoing basis (i.e., for an indefinite period of time). This "certain amount" is case-by-case, but if the amount the poor are receiving under the current programs is to be provided as basic income, it will be around a million yen per person. No eligibility condition means that no checking of each recipient's income or asset holding is carried out. And since money is provided on an ongoing basis, there is no mechanism that induces the recipients to do without public support and live on their own.

A number of questions immediately come to our mind. Why is money given to all, including those who do not need support? Since the number of support recipients increases dramatically, the resulting fiscal cost will be enormous. How can the government finance it? If all receive money that is enough to sustain their life, won't many of them lose incentive to work? How will basic income affect wages and inflation? Won't wages fall or inflation pick up? The proponents of basic income offer plausible answers to these questions ^{11) \approx 10}. Therefore, unlike its irrational and unrealistic appearance, basic income is not a fundamentally flawed policy. Still, if it is to be introduced, a major reform of the existing policy framework will be necessary, including that of social welfare and taxation.

Pros and cons of basic income have been debated from different angles, including politics and philosophy. But viewed from economics and economic policymaking, and in relation to the question of how to deal with social and economic problems arising from an aging population, we believe that one of the most important implications of basic income is that it links social welfare and taxation. It is not the case that basic income should necessarily be financed by heavier tax. But given the sheer size and permanent nature of needed finance, there is no other way than to increase taxation^{*11}. As the population ages, fiscal costs from not only social welfare but also pension, medical care, and old-age care are expected to increase very substantially. Therefore, sooner or later, taxation needs to be fundamentally strengthened. However, as the recent history of consumption tax in Japan demonstrates, a reform focused on tax tends to attract staunch resistance, and is often derailed or delayed. If a tax reform is proposed along with basic income, the inevitability of heavier taxation may be clearly understood by the public, and a momentum to accept it as part of a policy package may be generated.

One additional point we would like to make is about the COVID-19 measure in 2020 that distributed 100,000 yen to all individuals living in Japan. Initially, this measure was proposed as targeted hand-out of 300,000 yen to those households whose income had fallen due to the pandemic. But in the end, a lower amount was given to everybody. This measure is sometimes justified as a "kind of basic income", but this is not correct. Basic income is a comprehensive reform that encompasses its finance and restructuring of the existing welfare programs. But the measure in 2020 mimicked only the "same amount of money to everyone" part of it. In light of the urgent need for income support felt at that time, resorting to such an untargeted measure may have been excusable. Still, it was a populist policy in nature, and was inconsistent with the principles of the existing social welfare framework.

In order to avoid repeating a measure like this in the future, efforts should be made to improve social welfare administration so that better-targeted, and hence more efficient public support can be provided promptly. However, with little progress made on this front, another measure was introduced late last year that distributed 100,000 yen to all families with children of 18 years old or younger, regardless of how poor or well-to-do they are. These cases clearly indicate that there is a risk that "quasi basic income" policy that involves only the "cash handout to all" part is used for political convenience.

****10** Many books and papers are being published by basic-income proponents. See, for example, a book by Standing G (Ref. 11).

***11** Aversion of "tax credit", which has an effect similar to basic income and is often proposed as its more realistic alternative, explicitly links social welfare and taxation.

What about "rice-sic" income?

Yonei (2021)¹⁾ advocates basic income not in the form of money, but in the form of a coupon that can be exchanged for 100,000 yen of rice. His rationale is, first, that with this "rice-sic income", no one has to worry about starvation. And second, this form of social welfare also supports ricegrowing farmers and helps establish revitalization of Japan's agriculture as national priority. We now examine Yonei's interesting proposal, first from the consumer side, and then from the rice-growing farmers' side.

1) Support for consumers

In general, for the same amount of budget, distribution of a particular good or that of a coupon exchangeable with it is inferior to distribution of money in terms of its effectiveness *12 . This can be explained as follows.

Suppose a consumer receives a particular good worth 100,000 yen, or a coupon that can be exchanged with it. This consumer chooses his consumption mix that consists of 100,000 yen-worth of this good and other goods that he buys using his own income, maximizing his economic welfare. Call this consumption mix "A". For the ease of explanation,

suppose the good (or coupon) to be distributed is rice (or rice coupon). If the consumer receives 100,000 yen of cash instead, he can spend it all to buy rice and obtain the same consumption mix as A. But he can also spend it to buy something else, which enables him to choose many different consumption mixes. He compares economic welfare he can enjoy from these mixes, and chooses the one that gives him the highest welfare. If his choice happens to be A, the government's support in the form of rice or rice coupon is as effective as in the form of cash. But in most cases, there will be consumption mixes that bring higher welfare to the consumer than A.

The government expends 100,000 yen per person when it buys rice to be delivered or when it redeems the rice coupon presented by rice retailers. Thus, the fiscal cost is the same as when the government makes a cash transfer of 100,000 yen. This means that, for the same fiscal cost, distribution of rice or rice coupon achieves less consumer satisfaction than a cash transfer.

According to the Ministry of Agriculture, Forestry and Fisheries' "2020 Food Demand-Supply Table"¹², each Japanese annually consumes 56 kg of rice on average, which roughly translates into 24,000 yen of spending on rice. If 100,000 yen-worth of rice or rice coupon is distributed, most Japanese will not be able to fully consume it. This implies that the consumption mix, A, mentioned above is not desirable for most Japanese.

Yonei (2021)¹⁾ argues that in this case, consumers can sell their rice coupons, or exchange them for other goods, to achieve better consumption mixes. However, since supply of rice coupons far exceeds their demand, the market price of coupons will plummet. The lower market price shows that the coupon's value for consumers is well below its face value of 100,000 yen. This is another way by which we can see that consumers do not receive benefits commensurate with the fiscal cost.

The policy mentioned earlier to support all households with children was supposed to be implemented through distribution of coupons usable only for education-related expenses. But a large amount of administrative costs expected to arise from printing and distributing coupons led to a surge in protests and complaints, so the central government had to concede and allow cash transfers as well. In the end, most local governments in charge of the measure's administration seem to have chosen cash transfers. As we explained above, apart from administrative costs, coupon-based support under which the recipients' use is restricted to certain types of spending is an inefficient policy for satisfying households' needs. This type of policy is also found in regional promotion coupons, "GoTo travel" subsidies, and the lower rate of consumption tax applicable to food items. These are all examples of fiscal resources spent for inefficient or unfair policy measures.

**** 12** "Effectiveness" is measured by the extent to which each support measure increases economic welfare of the receiving consumers.

2) Support for rice-growing farmers

Even if distribution of a particular good or a coupon whose use is limited to it is inefficient in supporting consumers, it will benefit the producers of the good. Since "rice-sic income" subsidizes rice consumption, it will stimulate demand for rice and help rice-growing farmers. Therefore, if supporting farmers is an important policy objective, distribution of rice coupons is a possibility^{**12}.

However, in this case, one needs to ask how important for Japan it really is to support rice farmers. Economics tells us that it is best to expand domestic production of goods that a country can produce efficiently, while importing goods that foreign countries can produce more cheaply. Rice is a typical example of goods foreign countries can produce more cheaply and efficiently, but Japan has long protected rice farmers. In trade negotiations, the Japanese government has treated rice as "sanctuary", and when it manages to push back other countries' demand for rice market access, it is reported back home as a great victory. But from the viewpoint of economics, this is as perverse as celebrating a self-inflicted injury. Even if we are to promote our primary industry, the target should not be rice, but other primary products whose quality is internationally high and whose export is expanding, such as fruits, fishery products, and beef.

One can raise a geo-political objection to the economicsbased argument made above. Japan's food sufficiency ratio is very low, so our food security is exposed to risks from international conflicts or disruptions of overseas food production for various reasons, including climate change. In view of these risks, maintaining or expanding domestic staple food production may be strategically necessary. To this view, we would like to present the following (perhaps not so politically correct) analogy.

Japan has in its neighborhood two countries that own nuclear weapons, one of which is launching one missile after another toward us. One option we have to deal with this situation is to fundamentally strengthen our military power, possibly putting an end to our traditional "no nuclear weapons" policy. But this is not the only option. We can rely on our allies' nuclear power and its deterrence effect. We can work closely with other countries in the region to put diplomatic and other pressures on the hostile countries to keep their action in check. Many Japanese would prefer these options to the military one. Similarly, our option for addressing the risks to food security is not limited to strengthening domestic production. We could diversify sources of food import, play an active role in preventing international conflicts that may disrupt trade, and contribute to global efforts to slow down climate change to minimize its adverse effect on overseas food production. We cannot judge how effective these alternative options are. But at least, they can be pursued without contravening the logic of economics.

****13** Similarly, if the main purpose of offering public support to households with children is not to satisfy their economic needs but to increase their education spending so as to strengthen Japan's future human capital, limited-use coupons make more sense than cash.

Concluding remarks

In this paper, we took a cue from Yonei (2021)'s thoughtprovoking idea¹⁾, and reviewed economic policy issues posed by the aging population in Japan, a phenomenon which is likely to be accelerated by anti-aging medicine. In addition to those discussed in this paper, there are many other issues in which economics and anti-aging interact with each other. For example, how to meet the medical and old-age care needs expected to increase in the future (health economics), how to promote the elderly's labor participation (labor economics), how to cope with pressures on central and local government budget finance (public economics), the role of savings and investment that support our life after retirement (finance), the impact of population aging on macroeconomic variables and balance of payment (macroeconomics, international economics), how population aging affects cities and rural areas (urban and regional economics), and the effect of the aging of farmers on agriculture (agricultural economics). There are indeed so many areas where economics can collaborate with anti-aging medicine.

Conflict of interest

The author does not claim any relevant conflicts of interest.

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