Entering the post-demographic transition phase in Japan: Its concept, indicators and implications

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[Abstract]

In the early twenty-first century, the total population of Japan began to decline, after reaching its peak of 128 million. The total fertility rate has been below the replacement level since the middle of the 1970s and female life expectancy at birth exceeded 80 years old around the middle of the 1980s. It is obvious that this country has shifted to a new population regime, and here we introduce the new concept that Japan has entered a "post-demographic transition phase." For a country which has already experienced modernization and industrialization, this is the third phase of the total history of its population, following the "pre-demographic transition phase" and the "demographic transition phase." First, in this paper, we give a definition of the "post-demographic transition phase," rethinking classical theories of demographic transition, which anticipated fertility settling down at the replacement level and the total population returning to a stationary level after the transition completed. Second, we present demographic indicators which show when and how Japan entered this new era. From examining the changes in population growth rates, fertility patterns and mortality patterns, we conclude that the shift from the "demographic transition phase" to the "post-demographic transition phase" in Japan occurred between the middle of the 1970s and the late 2000s. Third, we illustrate that this shift in the demographic regime is closely associated with the socioeconomic, cultural and even political changes prominent in recent Japanese history. We are now faced with many difficult problems such as a rise in unemployment and a marriage squeeze among young people, an increase in poor single households particularly among elderly persons, and economic downturns and fears of a financial crisis at the national level. The study of demographic transition of Japan is important because Japan is leading other Asian countries in experiencing such drastic changes.

Introduction

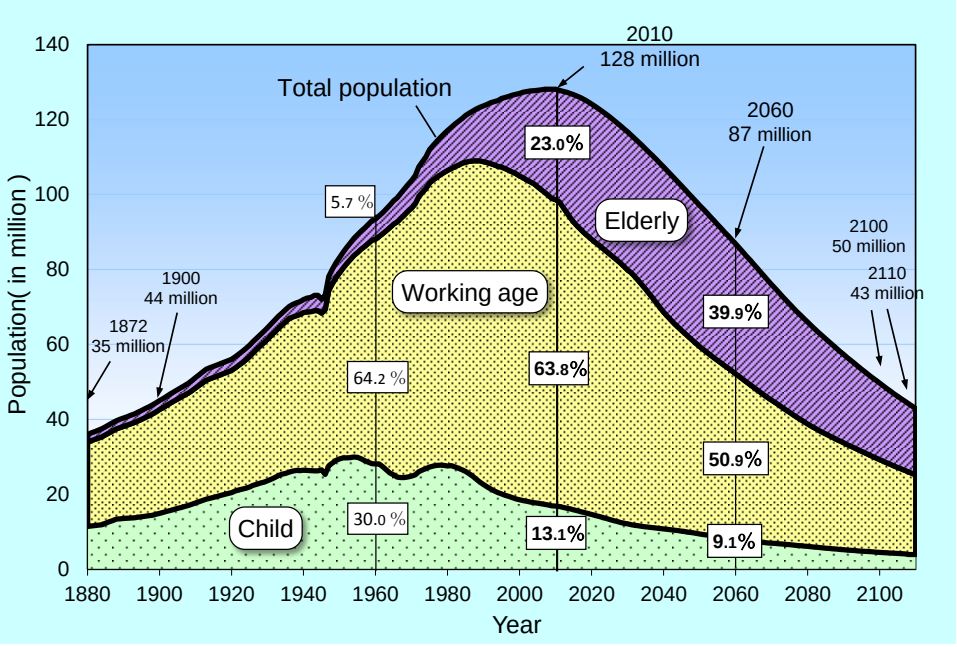
In the early twenty-first century, the total population of Japan began to decline, after reaching its peak of 128 million in 2008. The total fertility rate has been below the replacement level of 2.1 children per woman since the middle of the 1970s and female life expectancy at birth exceeded 80 years old around the middle of the 1980s. It is obvious that this country has shifted to a new population regime. This new regime has been called an "aged society with low fertility" or the "age of depopulation" (Note 1); however, we think these expressions draw only one side of the whole picture. In this paper, after rethinking demographic transition theory, we introduce the new concept that Japan has entered a "post-demographic transition phase." For this country, this is the third phase of the total history of its population, following the "pre-demographic transition phase" and "demographic transition phase."

In the first section of this paper, we give a definition of the "post-demographic transition phase," rethinking classical theories of demographic transition, which anticipated fertility settling down at the replacement level and the total population returning to a stationary level after the transition completed. In the second section, we present demographic indicators which show when and how Japan entered this new era. In the third section, we illustrate that this shift in the demographic regime is closely associated with the socioeconomic, cultural and even political changes prominent in recent Japanese history and described as the "lost two decades."

1. The Definition of the "Post-Demographic Transition Phase"

Figure 1 shows the long-term trend of the population of Japan from the late 19th century to the early 22nd century, in which the future population after 2010 is the projected one (both fertility and mortality: medium variation) released by the National Institute of Population and Social Security Research (NIPSSR) in January 2012 (NIPSSR 2012). The trend, which is like a symmetrical mountain, means that Japan's population is just now at its peak at 128 million and it will dramatically decrease to 87 million in 2060.

Figure 1. Growth and Reduction of Population of Japan: 1880-2110



Data source: Statistics Bureau(Ministry of Internal Affairs and Communications), *Census*, and *Current Population Estimates*. National Institute of Population and Social Security Research, *Population Projection for Japan: 2011-2060* (the medium-fertility and medium-mortality variant).

This population issue facing Japan is often called a "low fertility, population aging, and

population decline issue;" however, we think this expression just refers to changes in fertility as well as population size and age structure. We seek a more comprehensive expression based on demographic transition theory. We think that Japan and other industrialized countries have come to a new situation which traditional demographic transition theories have never assumed and a new perspective of Japan entering the "post-demographic transition phase" is needed (Note 2).

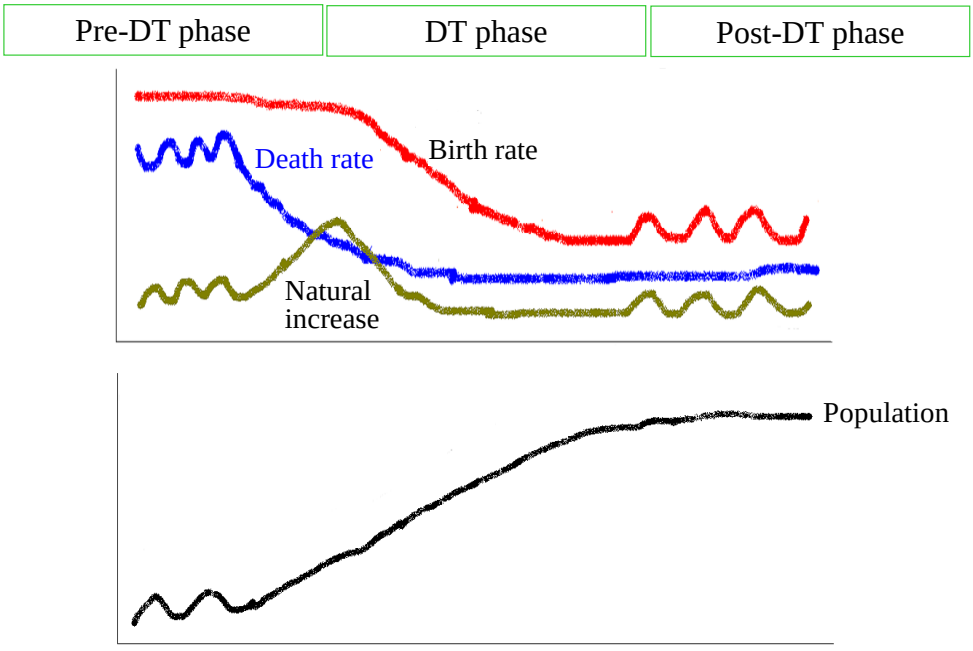
1) The concept and reality of demographic transition

The patterns of demographic change in modern societies are common and they are explained by the theory of demographic transition in which equilibrium of high mortality and high fertility changes into equilibrium of low mortality and low fertility (Note 3).

Figure 2 is an illustration drawn schematically for the demographic transition. In the "pre-demographic transition phase," which covers the periods until the Edo Period in Japan, a balancing of high mortality and high fertility resulted in a very low natural increase. Once the modernization of economic and social systems begins, mortality and fertility gradually decrease. Finally both mortality and fertility stabilize at a low level, resulting in nearly zero natural increase.

In Japan, which has had very few international migrants for its population size, the population increase rate almost equals the natural increase rate. Therefore, from the perspective of population growth patterns, the "pre-demographic transition phase" corresponds to the stagnation stage, the "demographic transition stage" corresponds to the growth stage, and the "post-demographic transition phase" corresponds to the stagnation stage, if based on the traditional concept of demographic transition (shown in Figure 2).

Figure 2. Schematic chart of Demographic Transition (1)



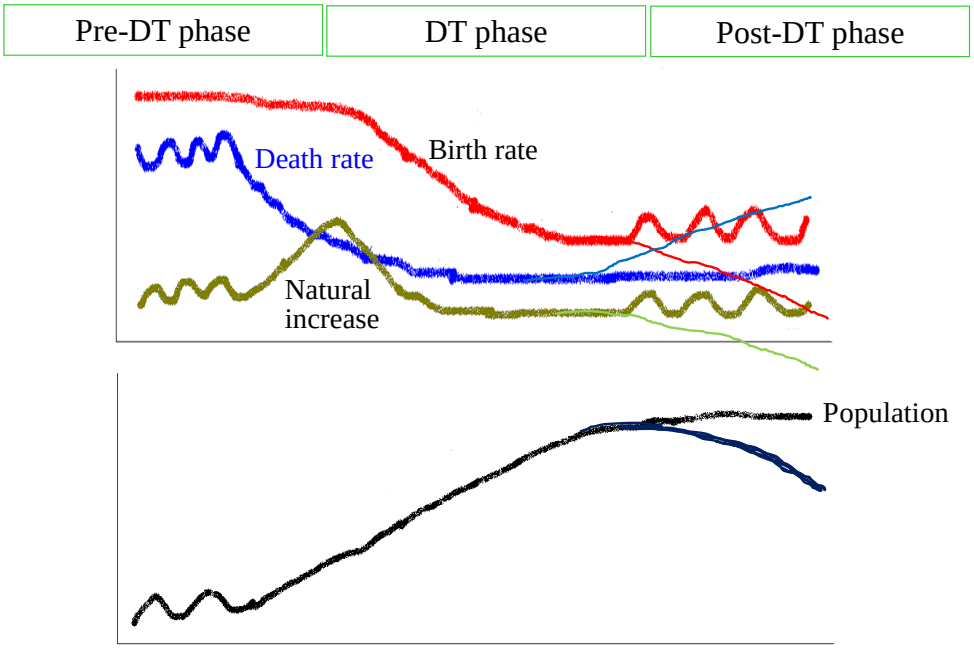
2) A change in the meaning of "post-demographic transition phase"

The idea of the traditional theory of demographic transition, which was conceived more than a half century ago, assumed a post-transitional regime in which fertility has settled down at the replacement level of about 2 children per woman and mortality for children and young people has improved to the maximum limit. It has not anticipated a dramatic decrease in mortality due to senility among the elderly. The completion of the demographic transition has meant that fertility and mortality return to a state of equilibrium, resulting in zero-population growth.

As a matter of fact, in today's Japan, we see such events that have not been anticipated by the "classic" demographic transition theory. Fertility has fallen far below the replacement level and the life of elderly people has continued to be prolonged. At present, the average life expectancy at birth

for Japan, more than 80 years old, is at the top global level and we expect it to increase further in the near future. We can say that the meaning of the "post-demographic transition phase" has changed (Figure 3). Now, it is not a stage of equilibrium but it is a new stage of an endless population decline along with below-replacement fertility and ultra-aged population, which humankind has never experienced (Note 4). This is a new challenge for humankind, especially for the Japanese people as the front runner.

Figure 3. Schematic chart of Demographic Transition (2)



Note: Actualized aspects in the post-demographic transition turn out to be very different from the hypothesized.

2. Indicators of Shift from "Demographic Transition Phase" to "Post-Demographic Transition Phase" in Japan

In this section, we examine when Japan shifted from the "demographic transition phase" (DT phase) to the "post-demographic transition phase" (post-DT phase). From the perspective of the population trend, we notice the following three indicators.

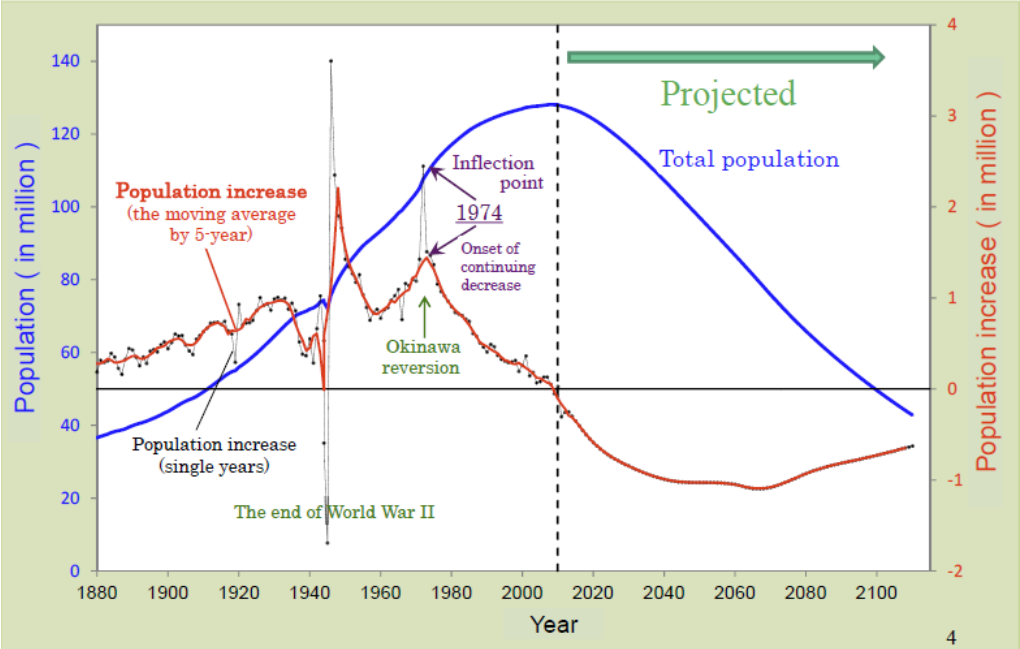
1) Total population: A shift from increase to decrease (Figure 1)

The new population projection, released in January 2012 by the NIPSSR projects (fertility and mortality: medium variant) that the total population of Japan will continuously decrease to 86,737,000 in 2060 from 128,057,000 in 2010, the latest census year (NIPSSR 2012). According to the population census (every 5 years) and population estimation between censuses (every year other than the census year) reported by the Statistics Bureau of the Ministry of Internal Affairs and Communications, the total population of Japan has almost continuously increased from 55,963,000 in 1920. The bureau estimates it reached its peak in December 2008, before it began to decrease. The Vital Statistics of the Ministry of Health, Labour and Welfare reported that the annual amount of natural increase (subtracting the number of deaths from the number of births) turned negative (-21,000) for the first time in 2005. After turning slightly positive (+133,000 in 2006, +132,000 in 2007, +51,000 in 2008) and, it again turned negative (-52,000) in 2009, and the drop shows a year-on-year increase with a fluctuation (+26,000 in 2010; -259,000 in 2011). Therefore, it is certain that the total population of Japan passed its peak in the late 2000s.

2) The population increase curve: Switch from convex to concave

Figure 4 shows the long-term trends of total population (blue line) and its annual increase rate (red line). With the exception of short-term changes caused by Word War Two and other temporal events, the line of population growth indicates approximately 1 percent of annual increase for about 100 years, from the 1880s (early Meiji Era) to the early 1970s. We can recognize that the population growth has slowed down toward zero since the middle of the 1970s; correspondingly the total population curve has changed its shape from convex to concave with its inflection point in 1974.

Figure 4. Population and population increase in Japan: 1880-2110



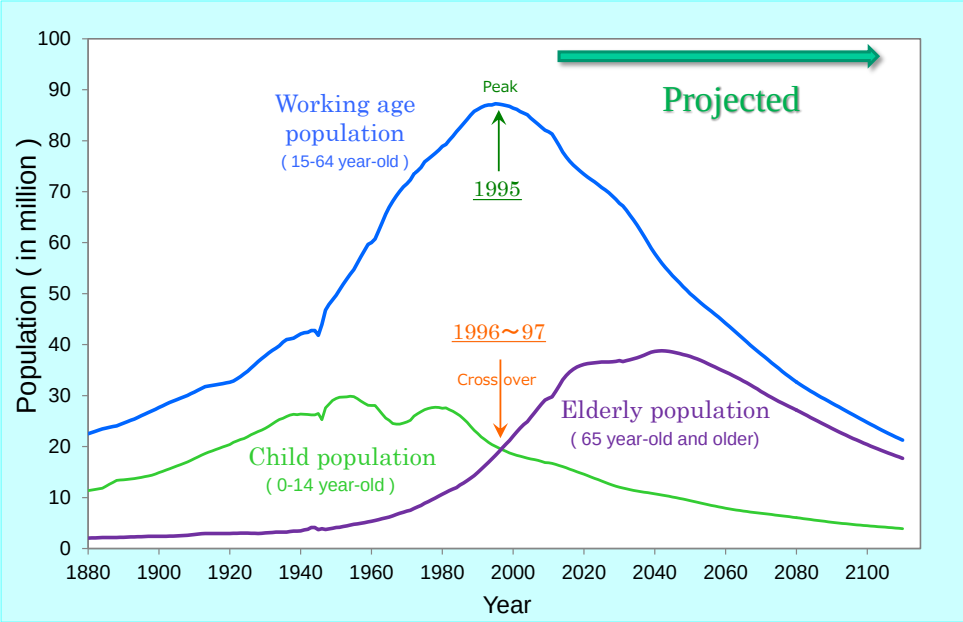
Data source: see Figure 1.

3) Working-age population: A shift from increase to decrease (Figure 5)

While the peak of the total population of Japan was in the late 2000s, the working-age population (aged 15-64) passed its peak as early as 1995. In the same figure, we see the increasing elderly (aged 65 and over) population exceeded the decreasing child (aged 0-14) population at almost the same time. This reverse is observed in the year from 1996 to 1997.

From these three perspectives, we suppose that the shift from the "demographic transition phase" to the "post-demographic transition phase" in Japan has occurred during the middle of the 1970s to the late 2000s. Then we examine the association with changes in fertility, mortality and the population age structure.

Figure 5. Population changes by age group: 1880-2110

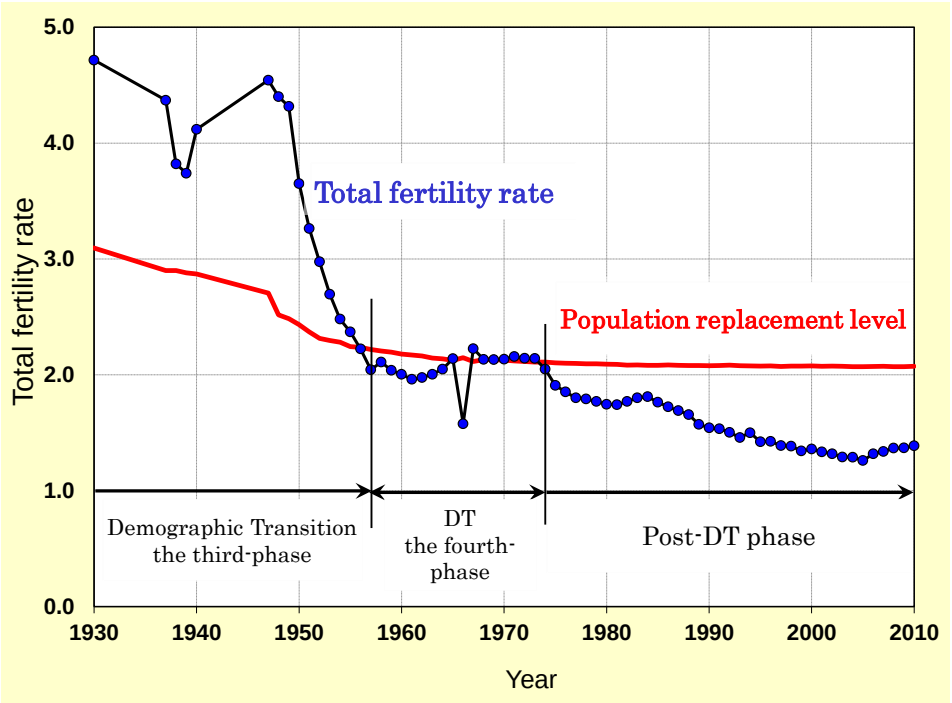


Data source: see Figure 1.

4) Fertility (Figure 6)

The blue line in Figure 6 is the trend of the total fertility rate (TFR) between 1930 and 2010, which was more than 4 children per woman during the post-World War Two baby boom (from 1947 to 1949), yet it immediately dropped to around 2 children per woman. After about a 20-year stable period (from the middle of the 1950s to the middle of the 1970s), the TFR began to shrink again and it has remained below the replacement level (about 2.1). In this figure, the red line represents the level of population replacement.

Figure 6. Trends of Total Fertility Rate and the Replacement Level: 1930-2010

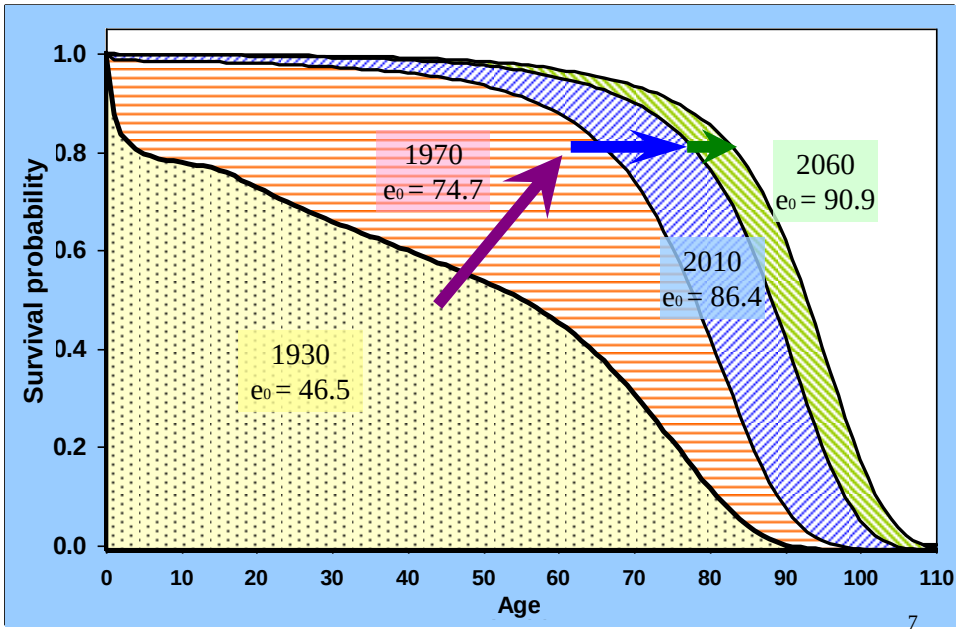


Data source: Ministry of Health, Labour and Welfare, *The Vital Statistics*.

5) Mortality (Longevity) (Figure 7)

Figure 7 shows changes in survival curves for Japanese women. Each curve, which is based on the life table for the year, shows how the number of survivors decreased as they aged. The most noticeable point is a change in the direction of the shifts of the curves. Between the 1926-1930 life table and the 1970 life table, the curves shifted to the upper-right (rectangularization), which indicates the improvement of mortality for young and middle-aged people to the maximum limit. After the 1970 life table, the survival curve shifted just to the right, and this horizontal shift is projected to continue in the future according to NIPSSR's population projections (NIPSSR 2012).

Figure 7. Changes in the Survival Curve: from 1926-30 to 2060

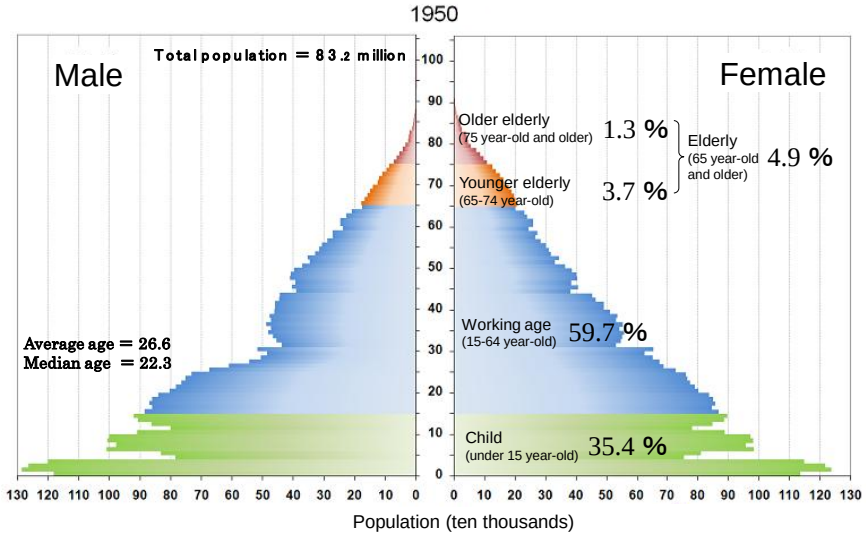


Data sources: Ministry of Health, Labour and Welfare, *The Complete Life Tables.* National Institute of Population and Social Security Research, *Population Projection for Japan: 2011-2060* (the medium-fertility and medium-mortality variant).

6) Population age structure (Figures 8, 9, 10 and 11)

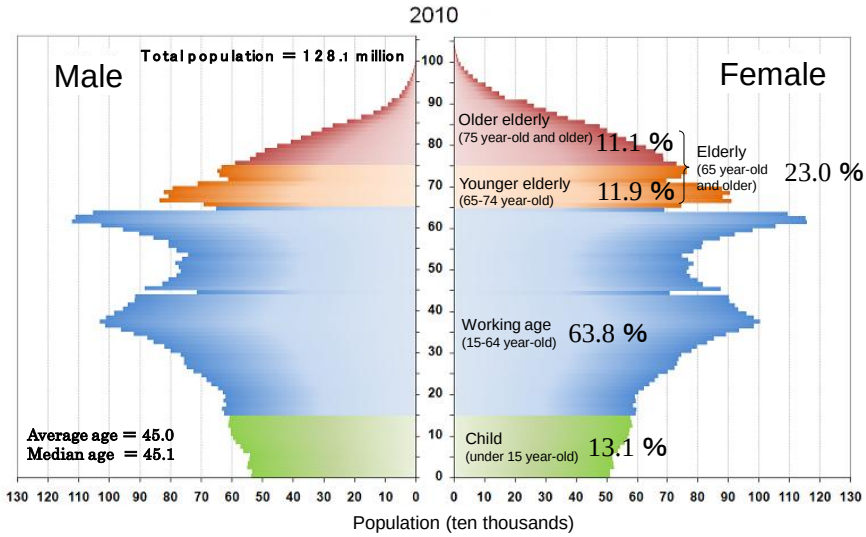
Figures 8 and 9 show the population pyramids for the census years of 1950 and 2010, respectively, which are drawn at the same scale in number of persons and age. The area of the pyramid (representing population size) has increased during this period, meaning that the 20th century was the age of population expansion for Japan. On the contrary, the population pyramids for the years 2030 and 2060 indicate that the total population of Japan will gradually shrink, meaning that the 21st century is the age of endless population decline for this country (Figures 10 and 11).

Figure 8. Population Pyramid 1950



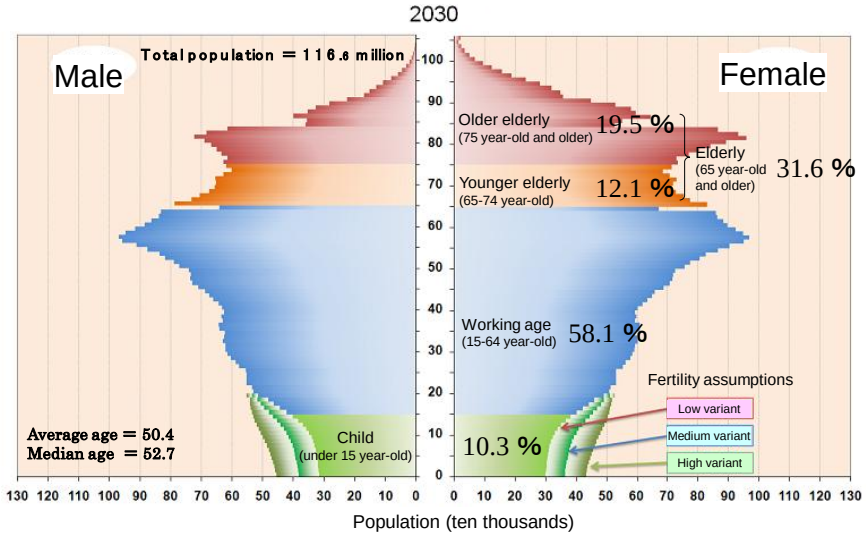
Data sources: Bureau of Statistics(Ministry of Internal Affairs and Communications) Census.

Figure 9. Population Pyramid 2010



Data sources: Bureau of Statistics(Ministry of Internal Affairs and Communications) Census.

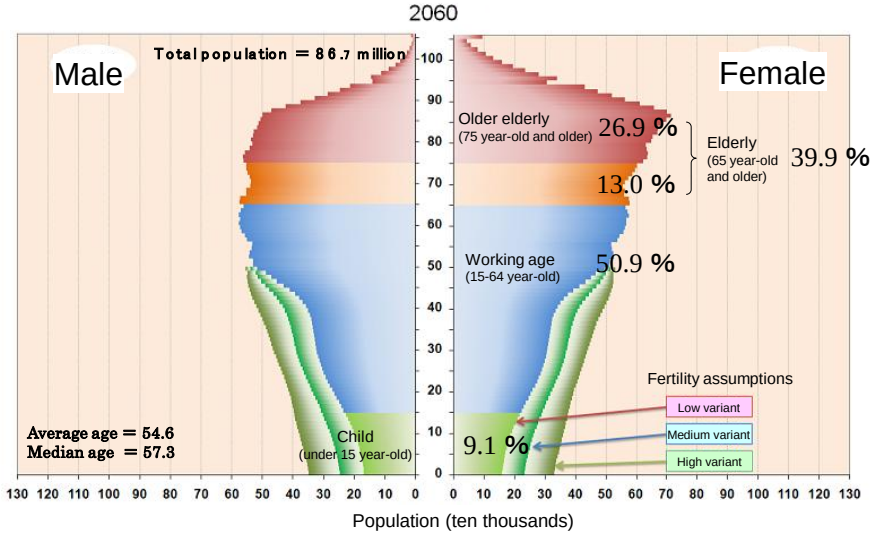
Figure 10. Population Pyramid 2030



Note: All values on the chart are for the medium-fertility and medium-mortality variant.

Data sources: National Institute of Population and Social Security Research, *Population Projection for Japan: 2011-2060*.

Figure 11. Population Pyramid 2060



Note: All values on the chart are for the medium-fertility and medium-mortality variant.

Data sources: National Institute of Population and Social Security Research, *Population Projection for Japan: 2011-2060*.

7) Transition of population momentum from more than one to less than one

The population momentum in Japan, which was at a level over one, turned to a level under one in 1996 (Ishii 2010).

To summarize, the differences in changes in total population, fertility, mortality (longevity) and age-structure pointed out in this section are listed in Table 1.

Table 1. Differences between the demographic transitional phase and the post-demographic transitional phase: Changes in population size, fertility, mortality, and age-structure

	DT phase	Post-DT phase
Total Population	Increase at accelerated pace (convex curve)	Increase at decelerated pace (concave curve) → peak → endless decrease
Fertility	High fertility → replacement level	Below-replacement fertility
Mortality	Improvement of mortality to the maximum limit among children, youth, and the middle-aged (rectangularization of survival curve)	Improvement of mortality among the elderly (horizontal shift of survival curve)
Age-structure of population	Late stage: Aging Population momentum > 1	Ultra-aging Population momentum < 1

3. Implications of "Post-Demographic Transition Phase"

In this section, distinguishing the characteristics of the "demographic transition phase" (DT phase) and the "post-demographic transition phase" (post-DT phase), we show the differences in Tables 2, 3, 4 and 5. As the population system and the socioeconomic system are always in close relation and they are mutually influencing, we suppose that the shift from the DT phase to the post-DT phase are necessarily accompanied by drastic changes in various aspects of socioeconomic, cultural and even political systems. Changes are also observed in other aspects in the population system, such as life course, social network, family and household.

1) Macro-economy, population distribution and migration (Table 2)

From the perspective of the macro-economy, the DT phase and the post-DT phase roughly correspond to the economic growth era and low-to-negative economic growth era, respectively. Japan's industrial structure had dramatically changed, and we completed the age of industrialization and entered the new age of "post-industrialization." While during the DT phase consumption and sales expanded, they are facing a reduction during the post-DT phase.

In terms of internal migration, there were large scale moves from rural to urban areas, and then those from urban centers to suburbs during the DT phase. This great change in internal migration after World War Two in Japan is called "migration transition." During the post-DT phase, those movements settled down and the "turn" phenomenon (U-turn, J-turn and I-turn) has been observed. Moreover, a reverse movement (re-urbanization) is noticeable.

With population density increasing, urbanization generally proceeded during DT phase, but the density will be decreasing in the 21st century in Japan. During the post-DT phase, it will be difficult for us to maintain the social infrastructure formed during the DT phase.

In terms of international migration, the DT phase is characterized as the age of sending migrants, and the post-DT phase is characterized as the age of receiving migrants.

Table 2. Differences between DT phase and post-DT phase: Changes in macro-economy, population distribution, and migration

	DT phase	Post-DT phase
Macro-economy	Economic growth (industrialization) Growth of consumption and sales	Low growth or minus growth "post-industrialization" Reduction of consumption and sales
Internal migration	From rural to urban (Migration transition) From urban center to suburb	Settle down of migration "U-turn, J-turn, and I-turn" Re-urbanization
Population distribution	Density increasing as a whole Urbanization Formation of social infrastructure	Density decreasing Depopulation Difficulty of maintaining social infrastructure
International migration	Sending country	Receiving country

2) Education, employment, mobility and social security (Table 3)

Regarding the educational system, completing high school (and vocational school in many cases) became the norm during the DT phase. During the post-DT phase, university (including junior college) education has widely spread, especially among women, and the importance of issues such as diversification, lifetime education and globalization (internationalization) has been stressed. While on the job training (OJT) was popular during the DT phase, during the post-DT phase enterprises cannot afford to do OJT and they often seek "immediately useful" workers.

In terms of employment, most workers became employees and a peculiar employment system was established during the DT phase. This system is characterized by simultaneous employment after graduating school, lifetime employment and promotions made by seniority. Due to economic growth, the unemployment rate was very low and workers could expect wage hikes year after year. During the post-DT phase, the typical and standardized pattern of employment was broken, and employment patterns have diversified. The unemployment rate has risen, non-regular employment has spread and wage levels have generally been lowered.

During the DT phase, we suppose, mobility was relatively high in both spatial moves and social moves. At this time, many young people moved from rural areas to urban areas, and they often obtained jobs and socioeconomic positions that were different from those of their parents. During the post DT phase, we assume a lower mobility, or a tendency for more young people to live with their parents and it is possibly less likely that young people will obtain a higher economic position than that of their parents.

The overall system of social security, including universal pension and medical care, was built during the DT phase when Japanese people benefited from the "demographic bonus." During the post-DT phase, Japan is facing hyper-aging, which is causing severe financial difficulty. We are suffering from a "demographic onus," and a radical revision of the current system is needed.

Table 3. Differences between DT phase and post-DT phase: Education, employment, mobility, and social security

	DT phase	Post-DT phase
Education	Universalization of high school and vocational school Spread of university education (especially for women) On the job training	Diversification Life time education Globalization More demand for "immediately useful" workers
Employment	Simultaneous and lifetime employment after school Very low unemployment rate Constant rising of wages	Diversification Increase in non regular employment and unemployment
Spatial and social mobility	Higher mobility ・from rural to urban ・job and social class different from one's parent	Lower mobility? ・place of residence ・social class?
Social security	Establishing social security systems, benefited from the "demographic bonus"	Financial difficulty, suffering from a "demographic onus" Need for reform

3) Family, household, life course and network (Table 4)

From the perspective of the family system, the DT phase corresponds to the period when the so-called "modern family" system was formed and spread. We suppose that because the family system stabilized (in some part, due to fewer divorces) and longevity increased, the kin network generally expanded (the number of kin members per person increased to the maximum) and stabilized despite of the decline in fertility. Entering the post-DT phase, there was a sway in the "modern family" system due to the decreasing marriage rate and rising divorce rate.

In terms of the household, the "nuclear family" type household, particularly a household type of a couple with children (typically two children) had spread during the DT period. This type of household was considered as the standard type of household and regarded as the basic unit in various social policies and administrative measures. Yet it is no longer considered as standard because other types of households such as single households, single-parent (single mother/father) households and households with elderly have increased during the post-DT phase.

From the perspective of an individual's life course (or a longitudinal view), longevity increases (in other words, mortality decreases) both during the DT phase and during the post-DT phase, but the stage of the age in which mortality rate mainly decreases is different. While the mortality of young and middle-aged people declined during the DT phase, the mortality of the elderly has declined during the post-DT phase. Partnership behavior and reproductive behavior have also changed. During the DT phase, after marriage had once become universal (almost all people would get married in their lifetime), women began to get married at older and have fewer children (about two children on the average). During the post-DT phase, the age of marriage continues to increase as the number of marriages decreases, and the average number of children has fallen below the replacement level (about two children per woman), while the proportion of women who have no children in their lifetime (childlessness) is increasing.

From the perspective of an individual's social network (or a cross-sectional view), the DT phase corresponds to the time when networks through kinship, neighborhood, workplace, and school were strengthened and stabilized. We suppose that such types of network will weaken during the post-DT phase. It is unknown what alternative types of networks will expand (for example, the utilization of the Internet may be the latest type).

Table 4. Differences between DT phase and post-DT phase: Family, household, life course, and network

	DT phase	Post-DT phase
Family system	Formation and spread of "modern family" Expanded and stabilized kin network	Sway in "modern family" Less marriage, more divorce Shrinking and weakening of kin network
Household type	Spread of nuclear family (a couple with children) as a standard household type	Increase in single households, one-parent household, and households with the elderly
Life course	Longevity extension (prolonged life course) at young and the middle age Later and less marriage/ childbearing	Longevity extension (prolonged life course) at the old age Increase of non-marriage and childlessness
Social network	Networks through kinship, neighborhood, workplace, and school	Weakening of existing types of network New types of network?

4) Gender, sexuality, culture and thought (Table 5)

From the perspective of gender, a system of gender division of labor was established during the DT phase. This system, a combination of a bread winning husband and a housewife, was highly efficient for both production (economic activities) and human reproduction. There was a remarkable gender gap in education and employment. Although this gap prerequisite for the gender division has decreased, institutions and people's consciousnesses have not changed much. This disharmony is supposed to be one of the most important factors of the very low fertility in Japan in the post-DT phase.

In terms of sexual behavior or sexuality, there was a sexual double standard, in which women were required to be chaste while men were allowed to frequent prostitutes (even encouraged). At the late stage of the DT phase, we suppose, a shift occurred from such "prostitution culture" to "love culture," in other words, the idea that marriage based on love is desirable had been diffused. Around 1970, the wave of sexual revolution, which had occurred in the 1950s and 1960s in Western countries (Billari et al. 2007, p.24), reached Japan. Marriage was no longer a necessary condition for sex among a couple. This is one of the behavior patterns among young people characteristic to the post-DT phase. More recently, sexlessness among couples and other phenomena indicating the diversity of sexuality have been noticed in Japan.

With respect to culture and trends of thought, we are concerned about the relationship between the two shifts: a shift from the DT phase to the post-DT phase and a shift from "modern" thought to "post-modern" thought. The DT phase corresponds to the period of economic growth, when, it is certain, there were views and consciousnesses praising mass production and mass consumption. It is natural that it would be reflected in the thoughts of that age.

Table 5. Differences between DT phase and post-DT phase: Gender, sexuality, culture and thought

	DT phase	Post-DT phase
Gender system	Establishment of gender division of labor	Alternative to gender division of labor?
Sexual behavior (sexuality)	Double standard of sex (chastity and prostitution) From "prostitution" culture to "love" culture	Sexual revolution (approval of premarital sex) Diversity of sexuality Sexless?
Culture and thought	"Modern" -- the faith in productivity, nation, bureaucracy, and enterprise -- uniform mass production and mass consumption	"Post-modern" -- a tendency to take a serious view of individual's sensitivity

5) Aging of eligible voters in Japan

As illustrated above, the shift in the demographic regime is closely associated with the socioeconomic and cultural changes in recent Japanese history. We are now faced with many difficult problems such as a rise in unemployment and the marriage squeeze among young people, an increase in poor single households and economic downturns and fears of financial crisis at the national level. Radical reforms of economic and social systems are needed, but are difficult to put into practice. One of the background factors is the aging of eligible voters (Table 6).

Table 6. Aging of eligible voters in Japane

Year	Mean age of eligible voters (years old)	Proportion of eligible voters who are under 35 years old (%)	Proportion of eligible voters who are 65 years and over (%)
1980	44.6	34.0	13.1
2010	52.7	20.9	28.3
2030	57.5	16.8	37.6
2060	61.5	14.2	46.7

Source : Population census for 1980 and 2010; National Institute of Population and Social Security Research, Population Projection of Japan (January 2012, medium variants for both mortality and fertility) for 2030 and 2060.

Note: Eligible voters are Japanese people aged 20 and over.

Concluding remarks

From demographic examinations, we noticed three indicators for the shift from the DT phase to the post-DT phase in Japan. The indicators are (1) the change in the trend of total population from an increase to decrease (in the late 2000s), (2) the change in the population increase curve from convex to concave (in the middle of the 1970s), and (3) the change in the trend of the working-age (15-64 years old) population from an increase to decrease (in the middle of the 1990s). Therefore, we can say that this shift occurred between the middle of the 1970s and the late 2000s.

The driving force of this shift is the further changes in fertility and mortality after they have completed the so far assumed fertility transition and mortality transition. Fertility has fallen below the replacement level since the middle of the 1970s. In terms of mortality, the mortality decline in the elderly has begun. This change in the mortality pattern means that we have become able to control death due to senility to some extent, reflected in the shift of the survival curve direction from the upper-right (rectangularization) to just the right (horizontal direction). Because of these correspondences, we think, the categories of "demographic transition phase" and "post-demographic transition phase" are more comprehensive than "population increasing phase" and "population decreasing phase" when trying to understand long-term population changes in industrialized countries from the modern age to the near future.

In this paper we described the drastic changes in demographic, economic and social aspects, based on a new view of the advent of the "post-demographic transition phase." This new phase is an age of downsizing in the population-economic-social system as a whole. Existing systems and institutions, which were built during the DT phase premised on growth and enlargement, have now become out of date. A redesign is needed in the post-DT phase. We are now pressed to create a new grand design of the population-economic-social system from a long-term and historical perspective.

(Note 1)

For one of the most important issues facing Japan from the present to the near future, many Japanese researchers and experts have used expressions such as the advent of an "aged society with low fertility" or an "age of depopulation." Refer to Ohbuchi and Morioka (2006), Atoh and Tsuya (2007), Kanekiyo and Anzo (2008), Miyamoto (2006), Kono (2011) and Miyamoto (2011).

(Note 2)

Examples of using the word "post-demographic transition" include Leete (1987), Soares (2006), Marteleto (2010) and Huber (2010).

(Note 3)

For general explanations of demographic transition theory, refer to Casterline (2003), Caldwell (2006), Dyson (2010), and Lee and Reher (2011).

(Note 4)

Dirk J. van de Kaa and Ronny J. L. Lesthaeghe proposed the concept of the Second Demographic Transition (SDT) to explain the decline in fertility and related changes in behavior and values that occurred in Western European countries after World War Two (van de Kaa 2003). This paper, however, does not use this word as a key concept, because we cannot say definitely that this theory, which explains demographic changes characteristic to the Western European situation, applies to the case of Japan.

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