For example, the large-scale second baby boomer generation's growing desire to get married and/or have children itself forms a market and is likely to gather momentum through mass media and similar channels. Magazines targeting women aged 30 years and up began to feature many positive articles featuring marriage, pregnancy, childbirth, and childrearing, and fashionable new words related to such subjects are becoming commonplace[4]. Furthermore, the government and local governments are advertising their measures as well. Spearheaded by the mass media, such measures seem to form a positive feedback relationship with the increasing fertility. Namely the initial rise from rebound caused increase in media coverage about marriage and family, which promoted further marriages and caused additional births to occur.

What will happen to this reversal trend of fertility in the future? First, if the rise in most cohorts would end up as a simple type-H period effect from rebound and temporary boom, the fertility rates should regress on the line of previous prospect. In this scenario where the recent boom comes to an end soon and it becomes difficult to maintain the current level if the fertility starts to stagnate and the feedback cycle with society is cut. Signs hereof may be already beginning to show in the monthly development.

On the contrary, if boom continues for long enough to make rises type-H' to raise the levels of completed fertility, and if those age patterns are continually succeeded by the following cohorts, then it means that the shrinking trend of cohort fertility reverses and the long term prospects of fertility should be seen as high as improved level of cohort completed fertility. In this case, the feedback relationship would be maintained. It is possible the group of single people and families of under-parity has ballooned to a huge size by now, because it contains the second baby boomers.

There are several other factors affecting the future course of fertility, among which the new child allowance is particularly notable. The new government has promised the adoption of this policy, and it amounts to 26,000 yen (about 290 US dollar) a month per every child through junior high. The current plan is to enact half the amount of allowance in April 2010, and the full amount in April 2011. Though it may have a certain impact on fertility, it seems necessary that it be perpetual and reliable to alter the long term trends beyond just period fertility in the short term.

E. CONCLUSION

Due to its peculiar combination of population dynamics, Japan will experience, by international standards, a very rapid population decrease, along with the highest proportion of elderly in the world. The prospect of continuing low fertility is mainly responsible for these changes in population dynamics, and thus it is one of the most important key to the society's future.

The fertility rates have dropped continuously since the mid 1970s below the replacement level until 2005, and Japan experienced the so-called lowest low fertility for a three-year period from 2003 to 2005. However, in the recent three years from 2006 to 2008, an upturn trend has been observed in the fertility rates, and TFR became to 1.37 in 2008.

It is estimated that the recent upturn could mainly be explained by the period effect, which does not change cohort completed fertility, and particularly the effects that temporally works and would be redeemed in other period (termed as the period effect of type-H). For some cohorts in higher ages, however, it is likely the completed fertilities become slightly larger than previously estimated (the type-H' effect). These are the different in causes from the upturns seen in the US and Europe, where the period fertility rates have been reversed mostly by "the tempo transition"(Goldstein et al 2009) which is the completing phase of the "postponement transition"(Kohler et al 2002). This corresponds to the period effect of type-T in our terminology.

The upturn in Japan seems to be caused by a rebound of the short term too-low fertility in the lowest low period, or in 2003-2005, followed by a boom induced mainly by the media targeting the single's and family of under parity's market whose size is unprecedented these years, partly because it includes the second baby boomers.

It is possible that the long term prospects of fertility formed in the latest population projection, which are based on the data corrected by the year 2005, might be underestimated in light of the present situation. It depends on whether the rise in fertility schedules of cohorts in their mid-thirties and beyond in this period is continually succeeded by the following cohorts ending up with rises in their

cohort completed fertilities.

In this article, the life course prospects with regard to family formation according to the population projection assumptions with the multistate life table techniques are described. For instance, the probability of never marrying, childlessness and having no grandchildren are 24.3 percent and 38.1 percent respectively in cohorts born in 1990. These figures indicate rapid prevalence of less-reproductive and non-familial life styles toward an unprecedented level in this society. Since the life course approach is effectual in explaining or testing the assumptions as well as in constructing, it should be more exploited in seeking long term fertility prospects or in population projections.

NOTES

[1] Since the fertility rate (i.e., including children with Japanese nationality born to non-Japanese women) and the total fertility rate (see the formula below) defined in the same way as in the Vital Statistics corresponding to the aforementioned fertility rate composition all depend on the demographic compositions of Japanese and non-Japanese women, they can be calculated as a result of population projection. Handling such individually defined fertility rates in the overall fertility rate assumptions of the future population projection makes the projection methodology considerably more complicated, though it is an indispensable mechanism for accurate reproduction of the future population status where international population exchanges have advanced.

Definition of the total fertility rate of the Vital Statistics;

$$\text{(Total fertility rate)} = \sum_{\substack{\text{Sum for ages} \\ (15\text{-}49)}} \frac{\text{(Number of births by Japanese females)} + \text{(Number of births with Japanese nationality born from non-Japanese females*)}}{\text{(Population of Japanese females)}}$$

* A child with Japanese nationality born from a non-Japanese female is a child whose father is Japanese.

[2] The model is based on the probability density function of the generalized log-gamma distribution, which is one of standard distributions in statistics. The fertility rate at age x for n-th birth is $f_n(x): f_n(x) = C_n \cdot \gamma(x; u_n, b_n, \lambda_n)$

where, $$\gamma(x; u_n, b_n, \lambda_n) = \frac{|\lambda_n|}{b_n \Gamma(\lambda_n^{-2})} (\lambda_n^{-2})^{\lambda_n^{-2}} \exp\left[\lambda_n^{-1}\left(\frac{x-u_n}{b_n}\right) - \lambda_n^{-2} \exp\left\{\lambda_n\left(\frac{x-u_n}{b_n}\right)\right\}\right].$$

Here, γ and exp are the gamma and exponential functions, respectively. C_n, u_n, b_n, and λ_n are parameters of the fertility rate function of birth order n; this is an extension of the Coale-McNeil Model. The further adjustment is made so that it should reproduce the characteristics of Japanese age-specific fertility rate precisely. A standard pattern of errors (ε_n) was identified by comparison with the actual fertility rates and the modeled rates to adjust the model schedule. As a result, the function of cohort fertility rate by age x, $f(x)$ is given as follows. See Kaneko (2003) for the details.

$$f(x) = \sum_{n=1}^{4+} C_n \cdot \left\{\gamma(x; u_n, b_n, \lambda_n) + \varepsilon_n\left(\frac{x-u_n}{b_n}\right)\right\}.$$

[3] This construction is applied only for Japanese women. The fertility rates of women with foreign nationalities are produced in relation to those of Japanese, using the observed relationships to be fixed for the future.

[4] "Kon-katsu" (activities to look for marriage partners) - there is affirmative nuance for the activities. "Ara-for"(Around Forty) - a somewhat positive title for single women around age 40, who are typically active in work and romance. "Sosyoku-danshi" (herbivorous boy) – a label for young men who are passive to romance and marriage, suggesting that women should be active to make those come into existence.

Table 1 Major Actions Taken by the Government toward Declining Fertility Rate

Year	TFR	Action
1990	1.54	An inter-ministry committee "Creating a Sound Environment for Bearing and Rearing Children"established
1991	1.53	Childcare Leave Act enacted
1994	1.50	The Angel Plan or the"Basic Direction for Future Child Rearing Support Measures"(1995-1999) formulated. The"Five-Year Emergency Measures for Childcare Services"planned
1995	1.42	Childcare and Family Care Leave Act enacted
1998	1.38	The amendment to the Child Welfare Law enforced
1999	1.34	New Angel Plan (2000-2004) formulated
2000	1.36	Child Abuse Prevention Law enacted
2001	1.33	The amendment to the Employment Insurance Law enforced
2002	1.32	The"Measures to Cope with a Fewer Number of Children Plus One" reported to the Prime Minister
2003	1.29	The Law for Measures to Support the Development of the Next-Generation, the amendment to the Child Welfare Law, and the Law for Basic Measures to Cope with Declining Fertility Society enacted
2004	1.29	General Policies of Measures for an Falling Birthrate, Parenting Support Chilren Plan
2005	1.36	Local governments, Companies in the formulation and implementation of action plans
2006	1.32	New Falling Birthrate
2007	1.34	Work Life Balance Charter - Work Life Balance Principles for Promotion, "Japan to Support Children and Families"Strategic Priority
2008	1.37	New Waiting Children Operation Zero", One Worry of Five Plan - (3) Protect and Nurture the "Children"and Social Future Leaders, National Conference on Social Security Report
2010		Planned implementation of the Child Allowance (50% in the first year)

Source: Ministry of Health, Labor and Welfare, Annual Reports, Cabinet Office, White Paper on Birthrate-Declining Society 2009. NIPSSR (2004).

Table 2 Average Number of Births by Duration of Marriage

Duration of marriage	7th Survey (1977)	8th Survey (1982)	9th Survey (1987)	10th Survey (1992)	11th Survey (1997)	12th Survey (2002)	13th Survey (2005)
0-4	0.93	0.80	0.93	0.80	0.71	0.75	0.80
5-9	1.93	1.95	1.97	1.84	1.75	1.71	1.63
10-14	2.17	2.16	2.16	2.19	2.10	2.04	1.98
15-19	2.19	2.23	2.19	2.21	2.21	2.23	2.09
20 years or longer	2.30	2.24	2.3	2.21	2.24	2.32	2.30

Sources: Kaneko et al 2008. The first-marriage couples only.

Table 3 Contribution of Subgroups to Period Effects of Type H in Selected Years

a. Age groups (%)

Age group	Years whose "period effect" exceeds 0.03				
	1989	1994	2006	2007	2008
15-19	4.2	- 2.0	- 6.8	- 5.2	- 2.9
20-24	26.1	10.3	7.8	1.7	2.5
25-29	58.0	42.6	7.9	11.5	16.1
30-34	17.9	32.0	46.5	43.1	39.0
35-39	- 4.0	18.8	42.5	45.5	41.8
40+	- 2.2	- 1.7	2.2	3.4	3.5
Total (values)	100.0 (-0.034)	100.0 (0.058)	100.0 (0.065)	100.0 (0.095)	100.0 (0.134)

b. Birth orders (%)

Birth order	Years whose "period effect" exceeds 0.03				
	1989	1994	2006	2007	2008
1st birth	57.9	58.9	42.5	40.4	40.8
2nd birth	34.3	27.3	33.6	29.8	30.0
3rd birth	5.6	9.7	19.4	24.0	22.8
4th & higher	2.1	4.1	4.5	5.7	6.4
Total (values)	100.0 (-0.034)	100.0 (0.058)	100.0 (0.065)	100.0 (0.095)	100.0 (0.134)

Note: Comparatively outstanding values for the age groups and birth order are underlined.

Table 4 Assumptions of Fertility Component and Total Fertility Rate for the Reference Cohort (born in 1990)

Measures of Fertility Components	Observed: cohort born in **1955**		Assumptions of Population Projection: cohort born in **1990**		
			Medium	**High**	**Low**
(1) Mean age at first marriage	24.9	⇨	**28.2**	27.8	28.7
(2) Proportion never married at age 50	5.8 %		**23.5 %**	17.9 %	27.0 %
(3) Couples' completed fertility	2.16		**1.70**	1.91	1.52
(4) Effect of divorce, widowhood and remarriage	0.952		**0.925**	0.938	0.918
Cohort Total Fertility Rate (Japanese women)	1.94	⇨	**1.26 (1.20)**	1.55 (1.47)	1.06 (1.02)

Note: The values are applied for Japanese women. The values in paresis for the cohort total fertility rates are those applied for Japanese women and babies with Japanese nationality.

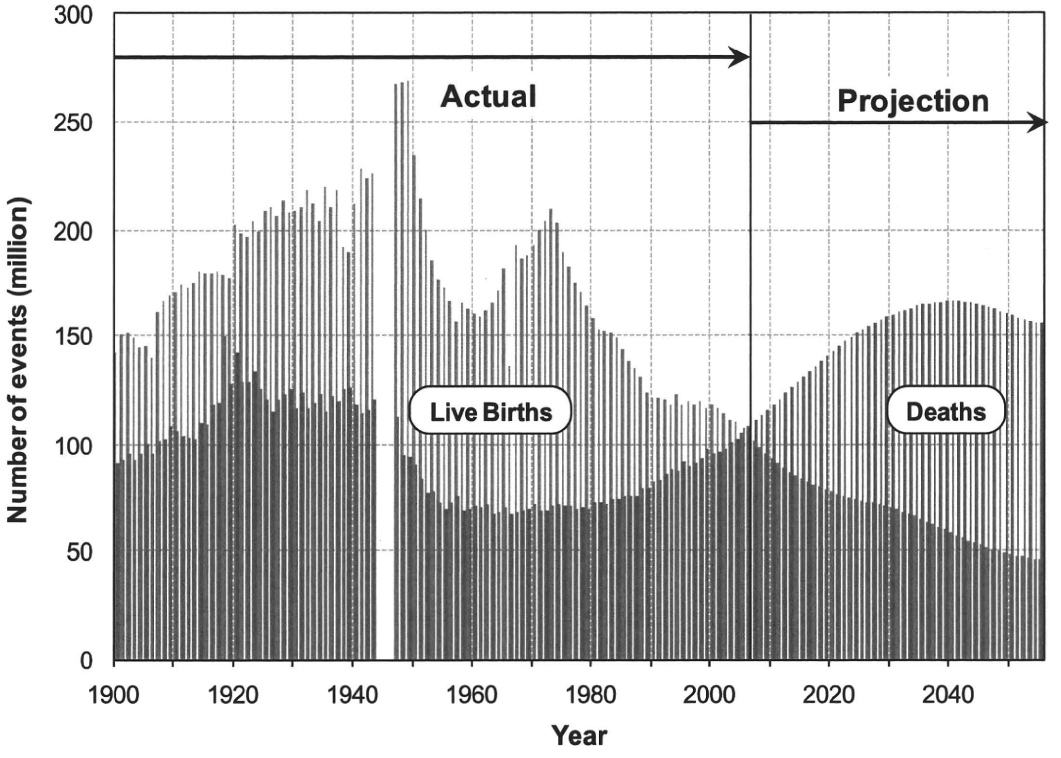
Table 5 Woman's Life Time Probabilities and Distributions by Family Status: Perspectives from the Medium Variant for Cohorts Born in 1950-90

(%)

	Birth year of woman's cohort								
	Recorded		Projected						
	1950	1955	1960	1965	1970	1975	1980	1985	1990
Life time probability of woman ... (at birth)									
Marrying	86.4	88.8	87.1	85.6	82.1	78.3	76.4	75.7	75.7
Having 1st birth	81.6	82.3	79.2	75.2	68.6	64.5	63.6	62.1	61.9
Having 2nd birth	70.4	71.1	65.8	58.6	49.8	45.7	44.8	43.9	43.9
Having 3rd birth	23.6	26.7	24.1	19.1	14.7	12.8	11.7	11.3	11.2
Having 4th and higher birth	4.2	4.7	4.5	3.8	3.2	2.7	2.3	2.0	1.9
Never marrying	13.6	11.2	12.9	14.4	17.9	21.7	23.6	24.3	24.3
Childless	18.4	17.7	20.8	24.8	31.4	35.5	36.4	37.9	38.1
Never having 2nd child	29.6	28.9	34.2	41.4	50.2	54.3	55.2	56.1	56.1
Never having 3rd child	76.4	73.3	75.9	80.9	85.3	87.2	88.3	88.7	88.8
Never having 4th child	95.8	95.3	95.5	96.2	96.8	97.3	97.7	98.0	98.1
Life time distribution of woman by number of child (at birth)									
Childless	18.4	17.7	20.8	24.8	31.4	35.5	36.4	37.9	38.1
Never married	13.6	11.2	12.9	14.4	17.9	21.7	23.6	24.3	24.3
Ever married	4.8	6.5	7.9	10.5	13.5	13.8	12.8	13.6	13.8
Only child	11.2	11.2	13.3	16.5	18.7	18.8	18.8	18.1	18.0
Two children	46.8	44.4	41.8	39.5	35.2	32.9	33.0	32.6	32.8
Three children	19.4	22.0	19.6	15.3	11.5	10.1	9.4	9.3	9.3
Four and more children	4.2	4.7	4.5	3.8	3.2	2.7	2.3	2.0	1.9
Net Reproduction Rate	87.5	90.0	84.5	76.3	66.3	61.2	59.6	58.1	57.9
No grandchild	22.2	21.2	25.6	31.6	41.2	46.8	48.1	50.0	50.2
Life time proportion of woman (without mortality effect = directly derived from fertility assumption)									
Never married	5.0	5.8	9.3	12.0	16.2	20.4	22.6	23.5	23.5
Childless	10.3	12.7	17.5	22.7	30.0	32.8	35.7	37.1	37.4
No grandchild	12.1	15.0	21.3	28.8	39.3	42.9	46.8	48.9	49.4

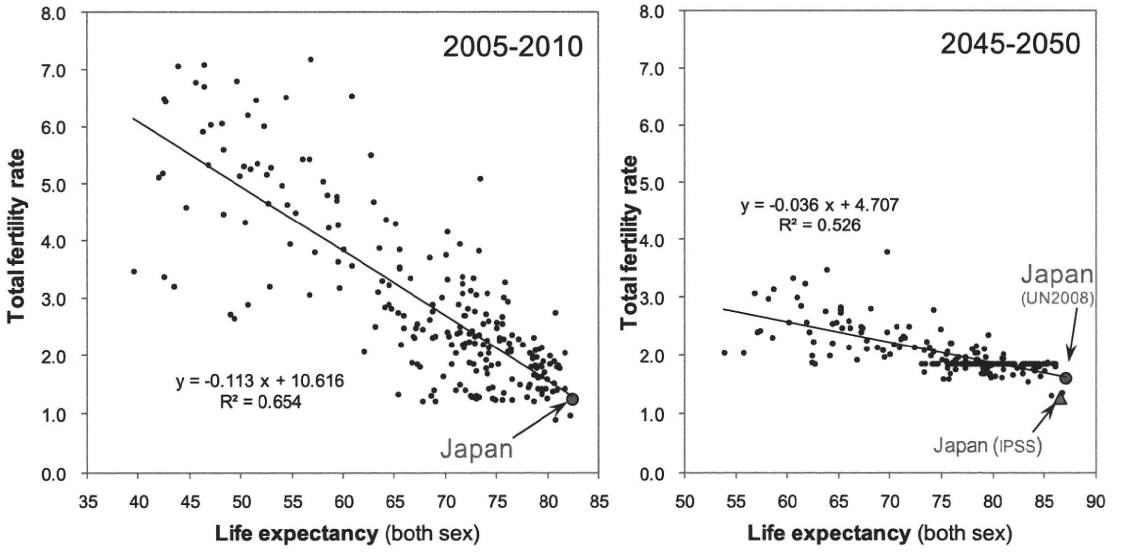
Source: From the projection 2006, medium-fertility and medium-mortality variant. The life time proportions of woman never married and childless (without mortality effect) are officially provided numbers. Other numbers are calculated by the author from the assumption. The sex ratio at birth for the net reproduction ratio is an officially provided assumption and is 105.4 (fixed value from average over year 2001-05).

Figure 1 Japanese Cross of Births and Deaths: Actual and Projection



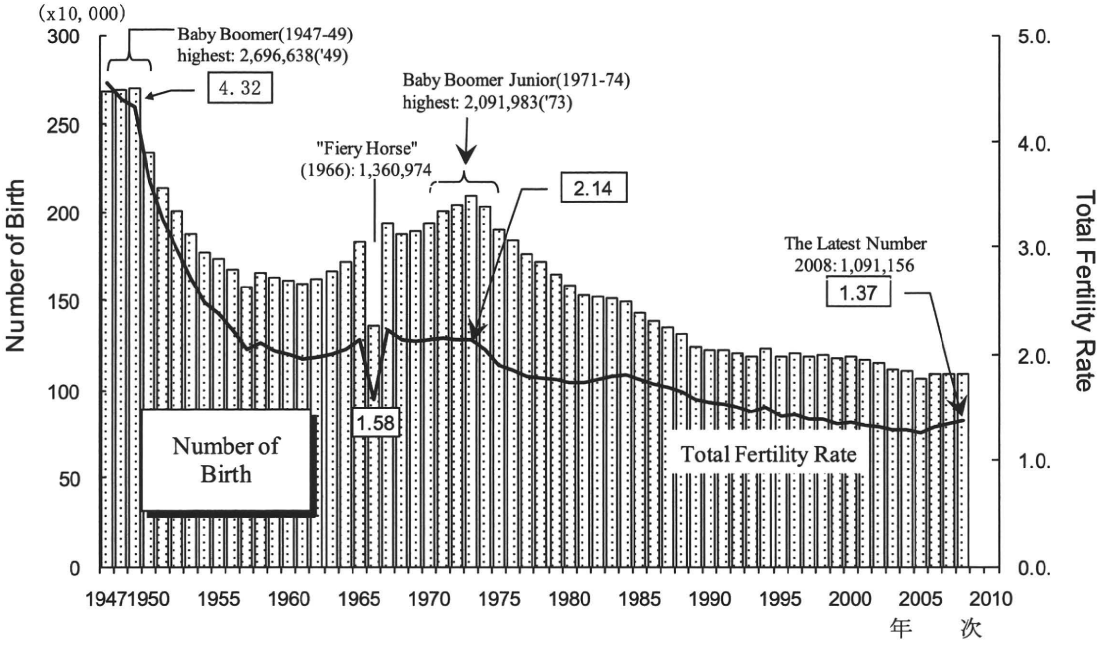
Source: NIPSSR(2006).

Figure 2 Japan's Distinguishing Position in Terms of Population Dynamics: Current and Future Projections



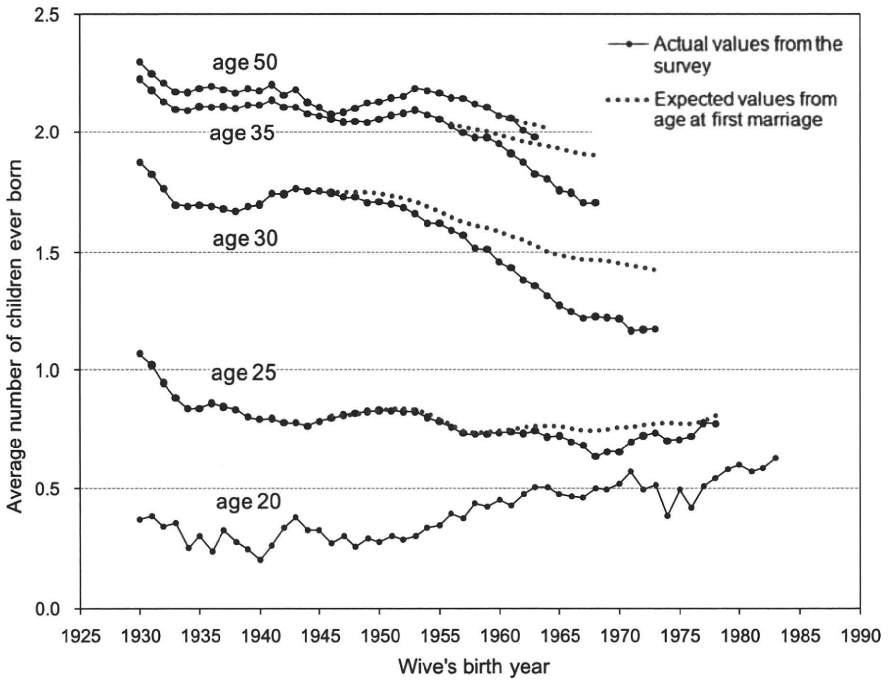
Source: United Nations (2009), NIPSSR(2006).

Figure 3 Numbers of Live Births, and Total Fertility Rate in Japan



Source: MHLW, The Vital Statistics

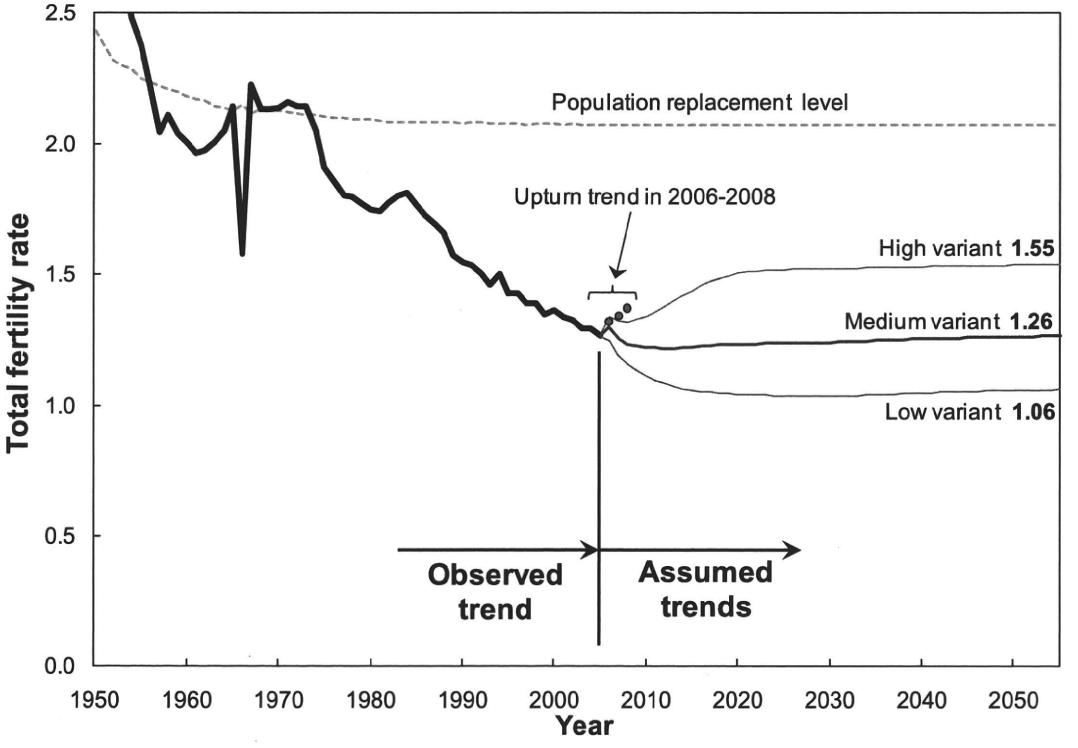
Figure 4 Cohort Trends of the Average Number of Children Ever Born to Married Women by Age: Actual and Expected from Age at First Marriage



Note: The actual values (lines with dots) are compared with the expected values (dotted lines) which are those predicted from age at first marriage in keeping with the statistical relationships derived from the logistic regression of the age in a quadratic form on the number of children ever born at each age.

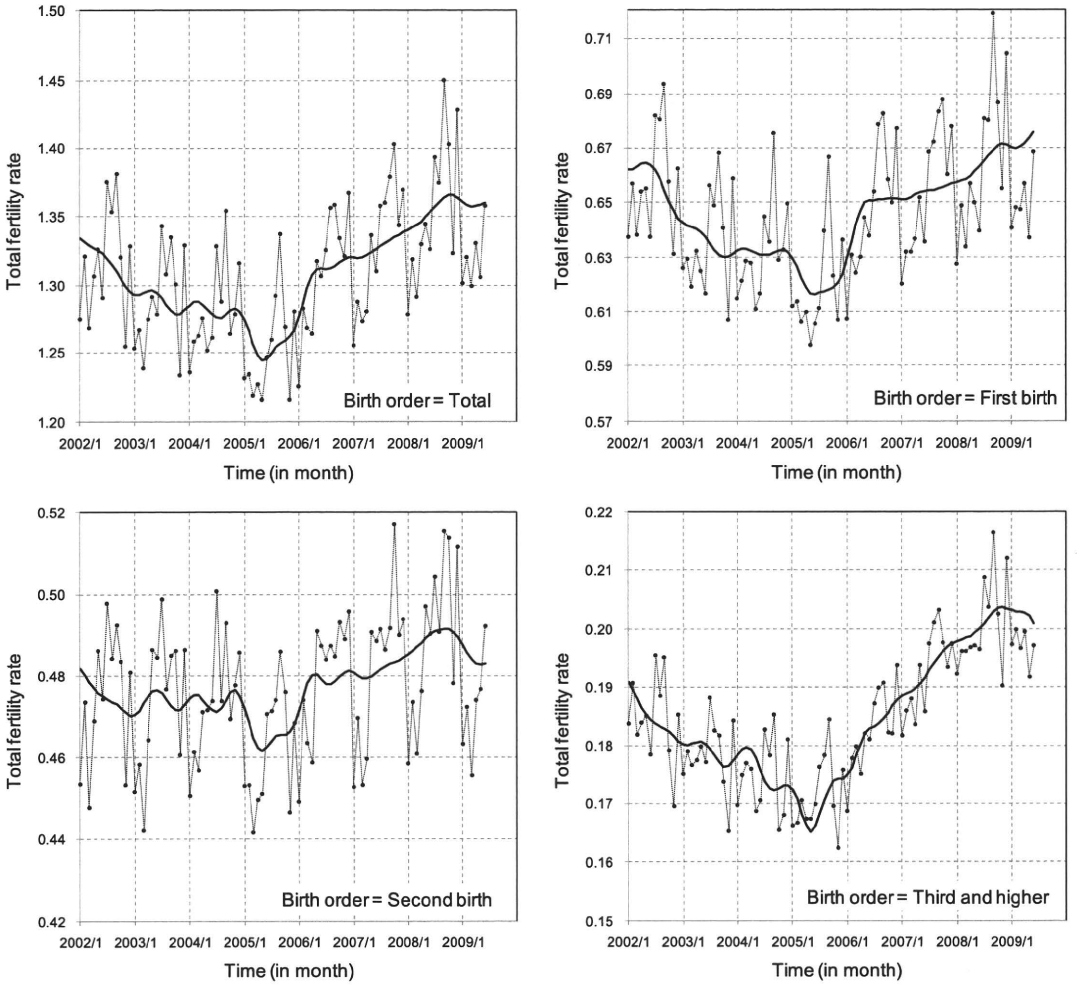
Source: The National Fertility Survey (NIPPSR).

Figure 5 Trends of Total Fertility Rate: Observed and Assumed.



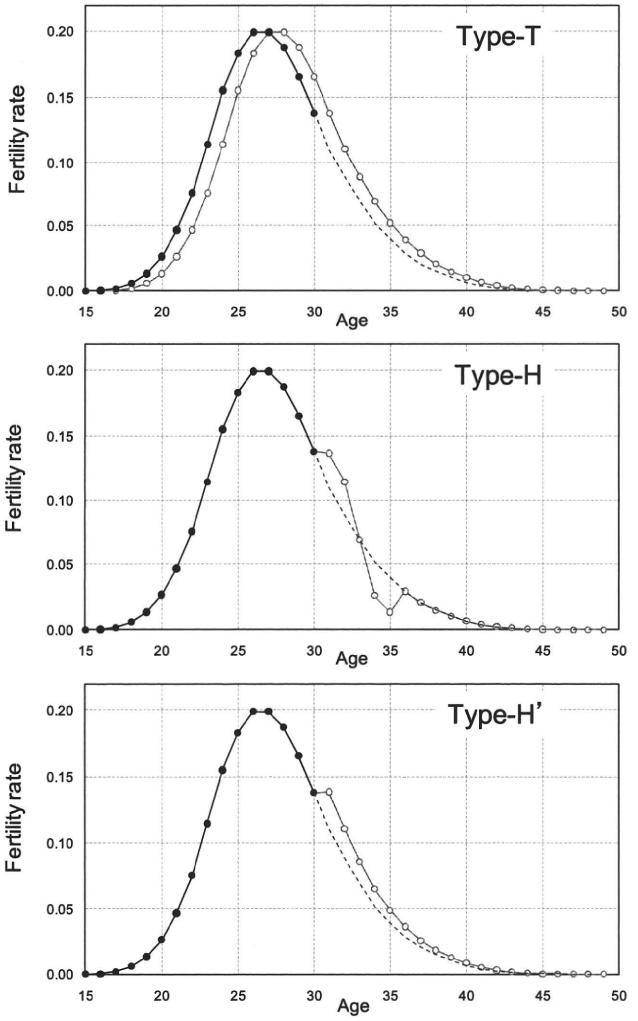
Source: The Vital Statistics, NIPSSR(2007).

Figure 6 Monthly Progresses of Fertility Rates by Birth Order: 2002-2009.



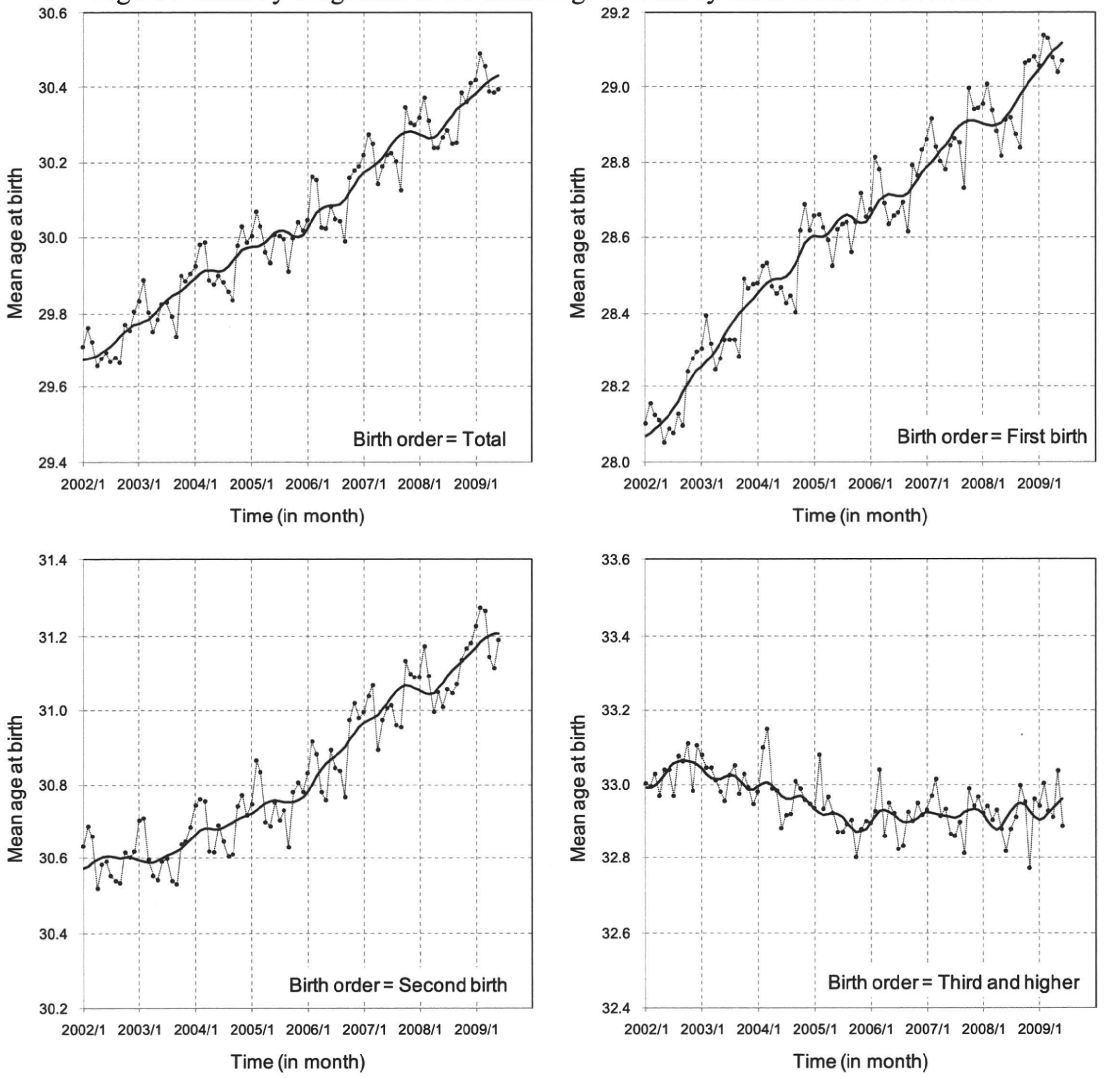
Note : Dots with thin lines denote monthly time series of annualized TFR by birth order, and lines represent seasonally adjusted trends with the U.S. Census Bureau's X-11 method.

Figure 7 Types of Period Effect in Terms of Cohort Fertility Schedule.



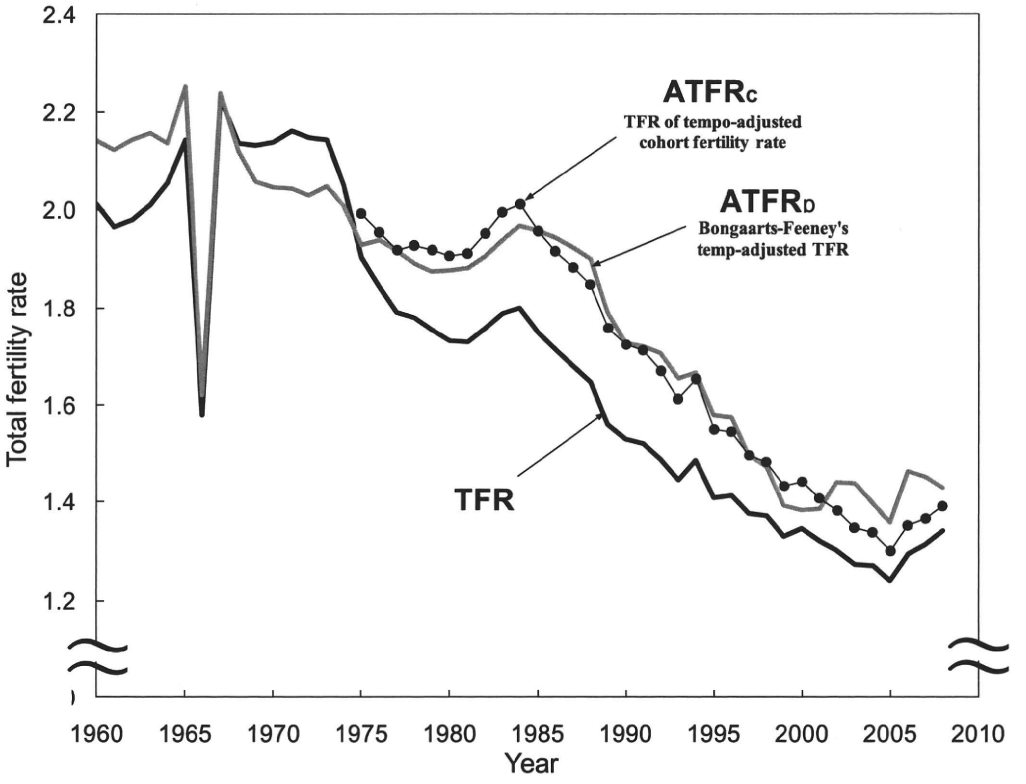
Note: The period fertility exhibits similar changes due to different type of changes in the cohort fertility level and schedule. The period effect of type-T is caused by the shift of the cohort fertility schedule. The period effect of type-H is caused by the temporary fluctuation that is redeemed in other period, while the type-H' effect is the temporary fluctuation that continues to change the completed level of cohort fertility. Thus the type-H' effect is not the genuine period effect by our definition.

Figure 8 Monthly Progresses of the Mean Age at Birth by Birth Order: 2002-2009.



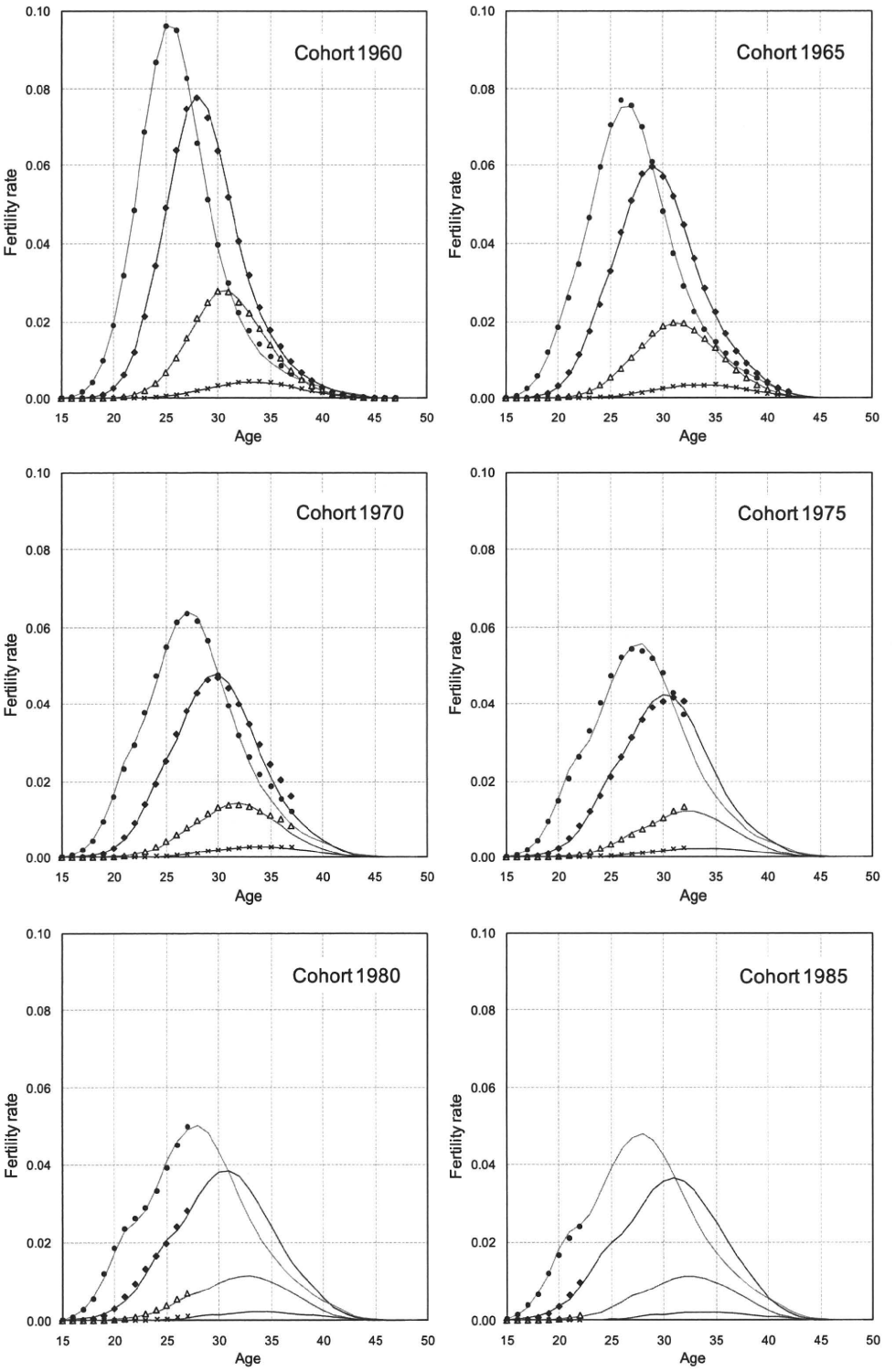
Note : Dots with thin lines denote monthly time series of the mean age at birth by birth order, and lines represent seasonally adjusted trends with the U.S. Census Bureau's X-11method.

Figure 9 Trends of the Total Fertility Rates with/without Tempo-adjustment



Note: The fertility rates are calculated based on births by Japanese women only.

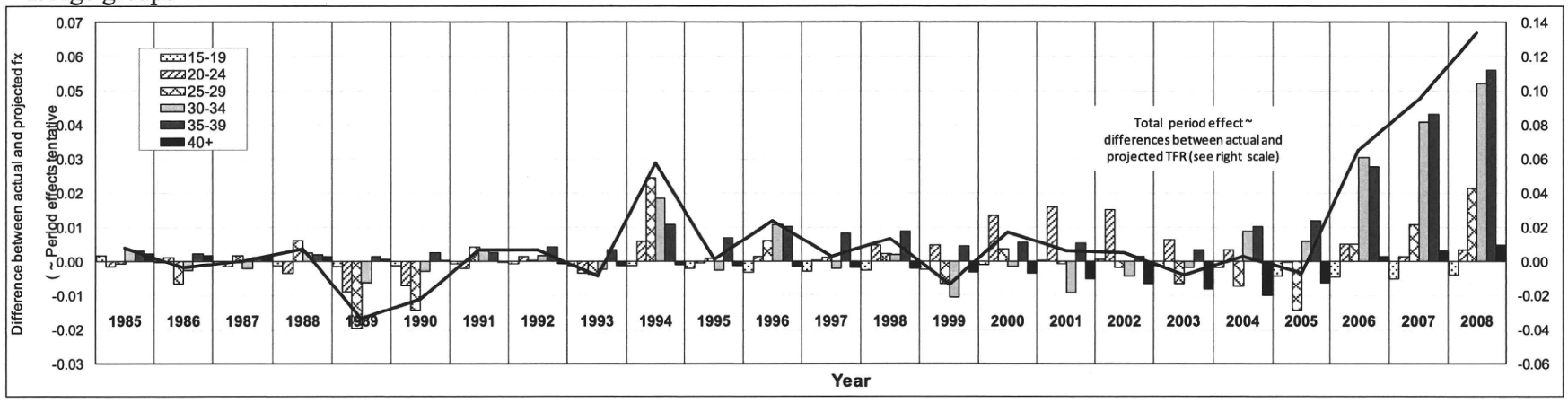
Figure 10 Actual and Modeled Fertility Rates of Japanese Female Cohorts by Birth Order



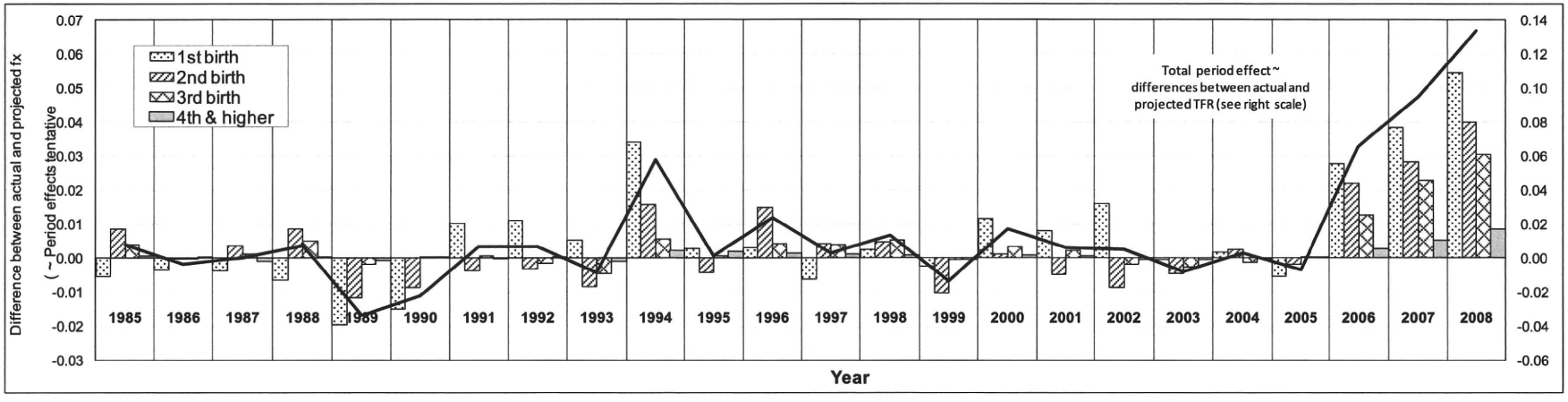
Note: Actual age specific fertility rates by birth order for female cohorts are plotted by dots, while modeled rates are plotted by lines. The actual rates are calculated only for female with Japanese nationality. The model rates are those employed in the official population projection conducted in 2006 as the medium assumption.

Figure 11 Estimates of Period Effects as Differences between Actual and Projected Fertility Rates by Five Year Age Groups: 1985-2008.

a. Age groups



b. Birth orders



Note : The total period effects (solid line – right scale) is drawn in half the scale of the effects by age group (bar graph – left scale). Fertility rates are calculated based on births by Japanese women only here as well.

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（2）報告資料（スライド）

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FERTILITY PROSPECTS IN JAPAN:

Trends, Recent Rise, and Lifecourse Projection

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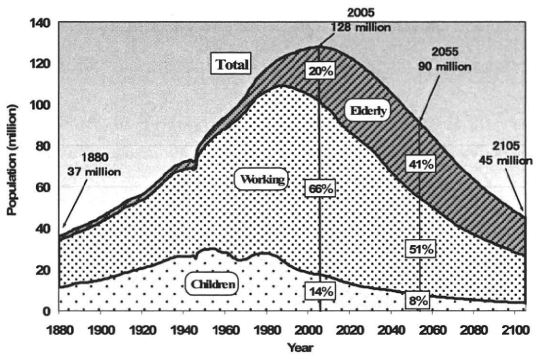
National Institute of Population
and Social Security Research
Tokyo, Japan

Outline

- Demographic Situation of Japan
  --- in terms of Fertility Prospects
- Recent Upturn of Fertility Rate
  --- Some analyses
  and implication for future prospects

POPULATION OF JAPAN: 1880-2105

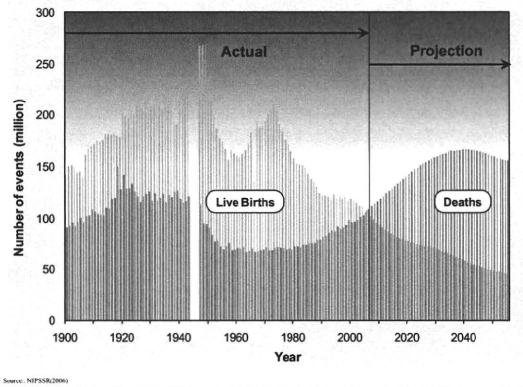


Source: Ministry of Internal Affairs and Communications, Statistics Bureau, *Census*, NIPSSR(2006), Population Projection for Japan:2006-2055.

Population Decline

- The population in Japan peaked in the period from 2004 to 2007 and gradually started to decline by now.
- The depopulation accelerates: losing more than 500,000 people every year from 2017, and more than 1 million people per year from 2039 and onward (IPPS projection).

Figure1 Japanese Cross



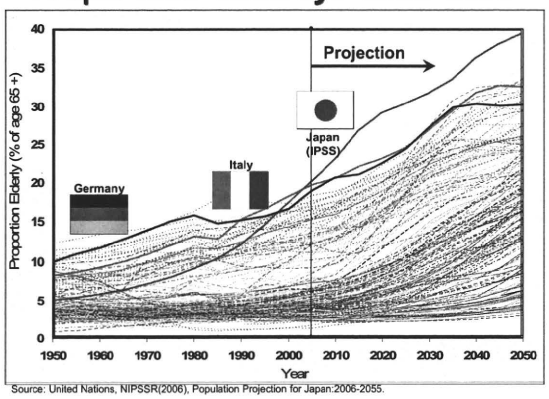
Source: NIPSSR(2006)

Population Ageing

- Japan has had the highest proportion elderly (% 65) in the world since approximately 2005,
- and continue to be so at least until 2050.

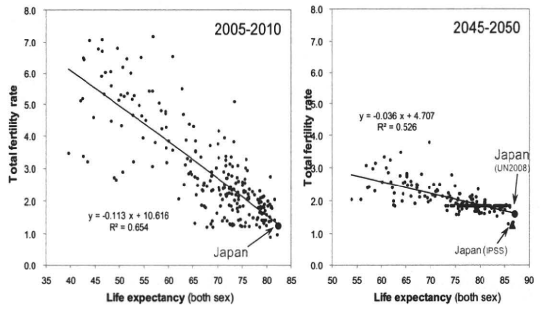
（2）報告資料（スライド）

Proportion Elderly: 1950-2050



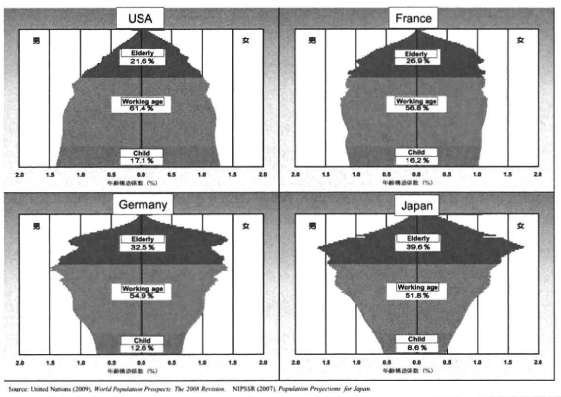
Source: United Nations, NIPSSR(2006), Population Projection for Japan:2006-2055.

Figure2 Japan's Distinguishing Position: Present and Future



Source: United Nations (2009), NIPSSR(2006)

Population Pyramids: 2050

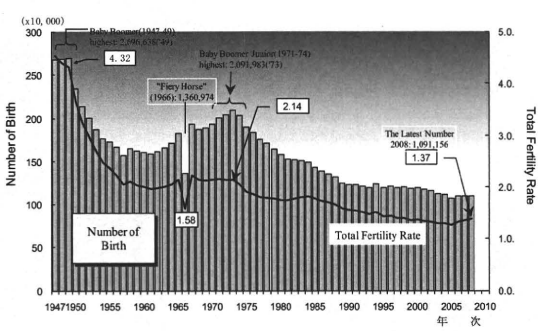


Source: United Nations (2009), *World Population Prospects: The 2008 Revision*. NIPSSR (2007), *Population Projections for Japan*.

Fertility Trends

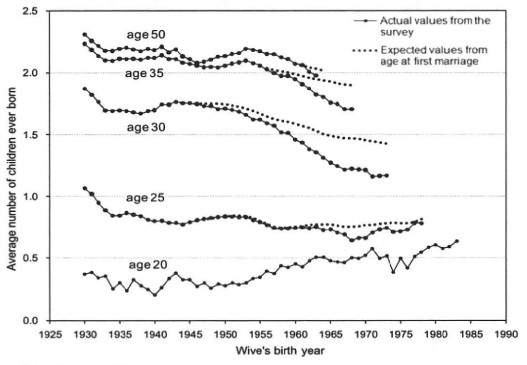
- The six decades of Japanese postwar trends may be divided into three phases.

Figure 3 Numbers of Live Births, and Total Fertility Rate: 1947-2008



Source: NIPSSR (2007), *Population Projections for Japan*

Figure 4 Cohort Trends of CEB to Married Women by Age: Actual & Expected from MAFM



Source: The National Fertility Survey (NIPPSR)

Upturn in 2006 and onward

Figure 5 Trends of Total Fertility Rate: Observed and Assumed

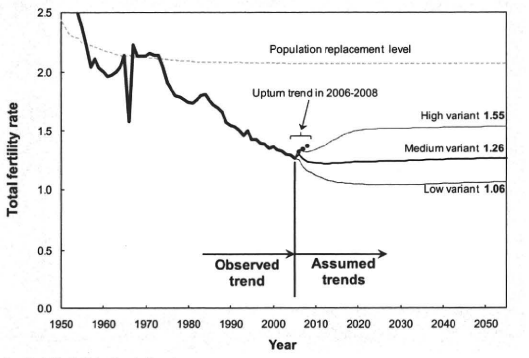


Figure 5 Trends of Total Fertility Rate: Observed and Assumed

Figure 6 Monthly Progresses of Fertility Rates by Birth Order: 2002-2009

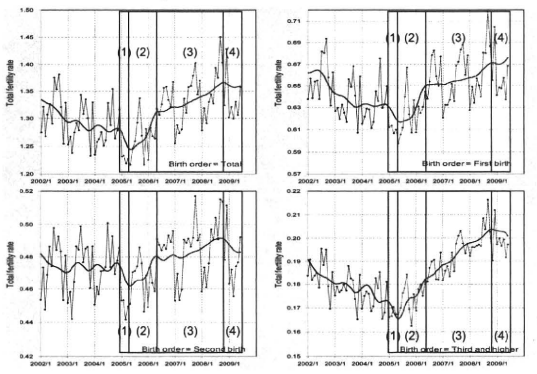


Figure 7' Types of Period Effect in Terms of Cohort Fertility Schedule

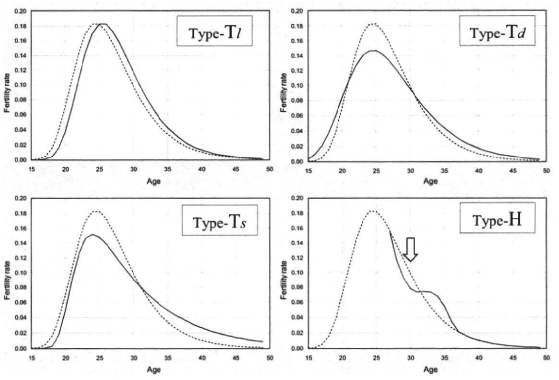
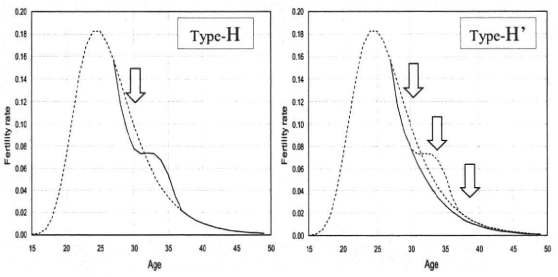
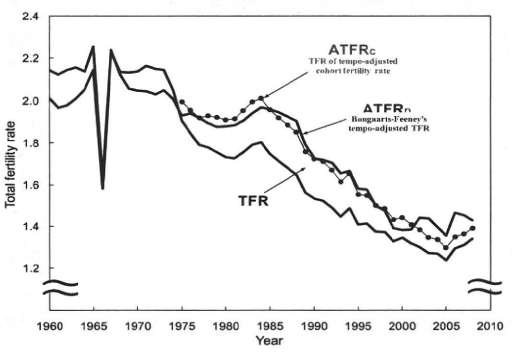


Figure 7' Types of Period Effect in Terms of Cohort Fertility Schedule



Type-H' is not a genuine period effect, because it changes cohort completed fertility. It rather be classified a *period-cohort effect.*

Figure 9 Trends of the Total Fertility Rates with/without Tempo-adjustment



(2)報告資料(スライド)

Figure 8 Monthly Progresses of the Mean Age at Birth by Birth Order: 2002-2009

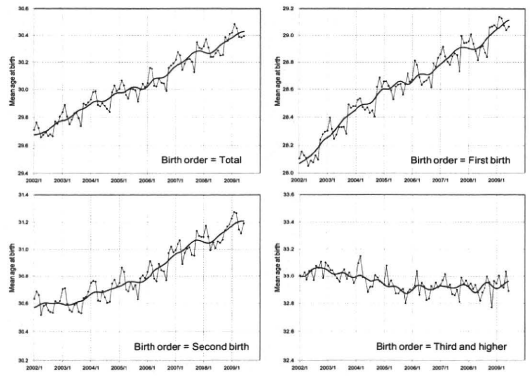


Figure 10 Actual and Modeled Cohort Fertility Rates by Birth Order

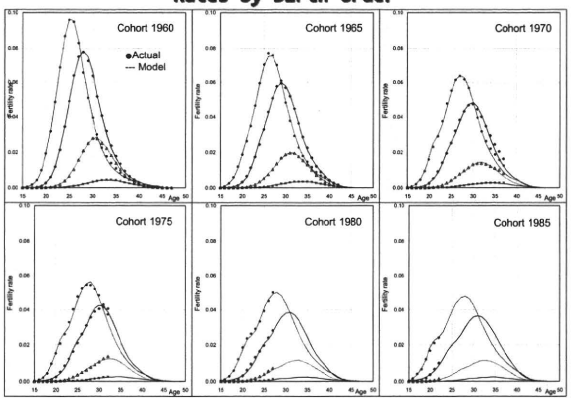


Figure 11 Estimates of Type-H Period Effects -Differences between Actual and Projected Fertility Rates-

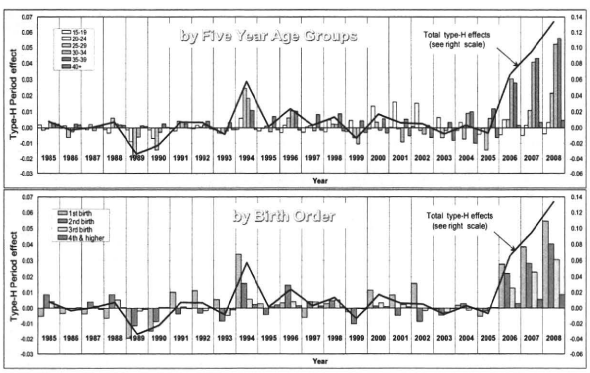
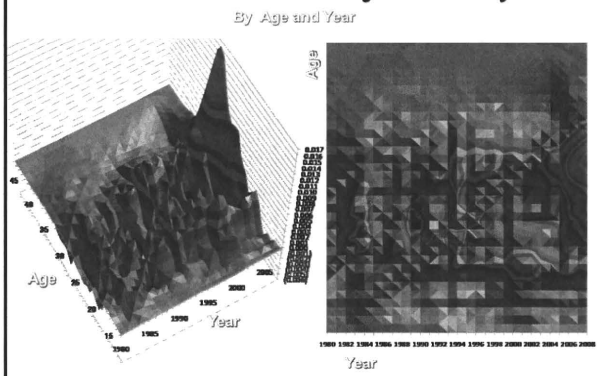


Figure 11 Estimates of Type-H Period Effects -Differences between Actual and Projected Fertility Rates-



Conclusion (1) General

- Due to its peculiar combination of population dynamics, Japan will experience, a very rapid population decrease, along with the highest proportion of elderly in the world.
- The prospect of continuing low fertility is mainly responsible for these changes.

Conclusion (2)

- The recent upturn could mainly be explained by the period effect, which would not change cohort completed fertility, and particularly the effects that temporally works and would be redeemed in other period (the type-H period effect).