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AN ANALYSIS OF DECLINE OF BIRTH RATE IN JAPAN

Revised Edition

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PREFACE

This paper is originally the report of demographic workshop of the 1962 - 1963 Training Program in Demography at Princeton University which was performed under supervision of Professor Ansley J. Coale, Director of Office of Population Research, Princeton University. I am deeply pleased to have an opportunity to publish it as one of English Series of Population Studies of the Institute of Population Problems, Welfare Ministry, Tokyo.

This is a revised print of English Pamphlet Series No. 57, 1963 in which the autor attempted to keep the composition of original paper, only corrected some sentence and added some new statistical materials.

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INTRODUCTION

The first modern census of Japan was taken in 1920. It was on about the same date that the birth rate began to decline. The crude birth rate was 36.2 per thousand of population in 1920, 32.4 in 1930, 29.4 in 1940, 28.1 in 1950, 17.2 in 1960 and 18.6 in 1965. The speed of decline of birth rate was especially rapid in Japan compared with the other West-European countries. That is, the time interval during which the crude birth rate declined from the level of 30 to 20 was seventy eight years in France, thirty seven years in Sweden and twenty seven years in England. On the contrary, it was only about twenty years in Japan.

The purpose of this paper is to analyse the decline of birth rate in Japan rather from demographic viewpoint than from sociological viewpoint. Although main concern is in the analysis of relationship between birth rate and marital status which is explained in Chapter III, some exposition on statistical data and the demographic transition of Japan is presented in Chapter I and Chapter II.

CHAPTER I

THE FUNDUMENTAL MATERIAL OF POPULATION
-CENSUS, VITAL REGISTRATION AND SOME ESTIMATES-

1. Population Census

Needless to say, the census data is the most important, fundamental, materials of population. In Japan the first census was taken on October 1, 1920. Since then, the statistics on the static situation of population has been regularly prepared.

After the first census taking, ten regular population censuses and four special censuses were conducted. Their names and dates are as follows:

Name of Census	Census Date
Population Census of 1920	October 1, 1920
Population Census of 1925	October 1, 1925
Population Census of 1930	October 1, 1930
Population Census of 1935	October 1, 1935
Population Census of 1940	October 1, 1940
Population Census of 1944	February 22, 1944
Population Census of 1945	November 1, 1945
Population Census of 1946	April 26, 1946
Extraordinary Population Census of 1947	October 1, 1947

Population Census of 1948	August 1, 1948
Population Census of 1950	October 1, 1950
Population Census of 1955	October 1, 1955
Population Census of 1960	October 1, 1960
Population Census of 1965	October 1, 1965

Coverage and accuracy of these censuses have been almost perfect, because of powerfully centralized system of administration and high cultural standard of the masses. The census result of Japan ranks in the "Highly Accurate Group.", according to the classification by U.N.[1)]

2. Vital registration.

The original system of vital registration of Japan started in 1872. In this year the Family Register was formed for the first time on a nation-wide scale. At first only births and deaths were registered, but since 1880 marriage and divorce were added in the items of registration and also still births

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1) The United Nations classified the census results of countries into five categories according to Whipple's Index as follows, I. Highly accurate data (Whipple's Index; less than 105); II Fairly accurate data (105-109.9): III. Approximate data (110-124.9); IV. Rough data (125-174.9); V. Very rough data (175 and more). U.N., Demographic Yearbook, 1960, pp. 17-19.

were added in 1886.

In 1899 the system of vital registration was changed from the decentralized system to the centralized one. This change contributed to make vital statistics much more perfect. By reason of this relation, the modern system of vital registration of Japan is ordinarily regarded to be established in 1899. And the consistent series of vital statistics have been published on the period since 1900.

According to the current rules of vital registration, notification of a birth must be made within fourteen days; that of death and still birth within seven days. However, there is no rule which provides time limit of notification of marriage and divorce.

The report of birth and death has been performed fairly well. That is, the percentages of delayed notifications to regular notifications has been fairly low and declining as shown in Table 1.

That the rules of vital registration have no provision about the time limit of marriage notification is the cause of disturbing the completeness of marriage statistics. The distribution of registered marriages by period between wedding and registration is indicated in Table 2.

TABLE 1

PERCENTAGE OF DELAYED NOTIFICATIONS TO REGULAR NOTIFICATIONS

Year	Birth	Death
1904 - 1913	4.01	0.60
1914 - 1923	3.96	0.62
1924 - 1933	3.33	0.67
1934 - 1943	3.17	0.63
1948 - 1952	0.95	0.52
1953	1.03	0.55
1954	0.92	0.53
1955	0.94	0.44
1956	0.94	0.39
1957	1.02	0.43
1958	1.00	0.42
1959	1.12	0.37
1960	1.09	0.36
1961	1.16	0.30
1962	1.08	0.27
1963	0.95	0.26

Source: Population Encyclopedia, Heibon-Sha 1957, p. 167; Division of Health and Welfare Statistics. Welfare Minister's Secretariat, Vital Statistics, appendix.

TABLE 2

DISTRIBUTION OF MARRIAGES BY PERIOD BETWEEN WEDDING AND REGISTRATION

(%)

	1950	1955	1960	1964
Total	100.0	100.0	100.0	100.0
Less than one year	73.5	80.8	85.7	90.8
1 - less than 2 year	17.6	12.3	8.9	5.3
2 - " 3 year	3.6	2.6	1.9	1.2
3 - " 5 year	1.9	1.6	0.9	0.7
5 - " 10 year	1.7	1.4	2.5	1.9
More than 10 year	1.6	1.3		
Unknown	0.1	0.1	-	-

Source: Division of Health and Welfare Statistics, Welfare Minister's Secretariat, Vital Statistics, 1964, Vol. 1, pp. 240.

In addition, the vital registration deals with only the marriage de jure, it does not include the marriage de facto which has not been registered. But there are considerable number of persons who are married in the de facto sense but married in the de jure sense. The definition of "married" in the census taking, to the contrary to vital registration, includes all persons who have spouse, no matter whether they have notified or not. The estimated proportion of person in unregistered marriage amont all married in 1920 is shown in Table 3.

TABLE 3

PROPORTION OF UNREGISTERED MARRIAGE AMONG ALL MARRIED
-AN ESTIMATION FOR 1920-

(%)

Age	Male	Female
10 - 14	100.0	96.1
15 - 19	68.5	57.1
20 - 24	44.4	30.4
25 - 29	27.2	18.2
30 - 34	18.5	17.1
35 - 39	15.4	13.9
40 - 44	14.4	12.7
45 - 49	13.6	11.8
50 - 54	12.8	9.5
55 - 59	13.1	8.6
60 - 64	12.7	5.7
65 - 69	12.8	4.3
70 +	19.9	0.8
Total	17.6	17.0

Source: Okazaki, A., Positive Study of the Population of Japan, 1950, p.421.

3. Populations before census-taking.

There are several population data for the period before census-taking.

(a) Domicile population.

The domicile population has been enumerated in conformity with the Family Registration Law. The first enumeration was conducted on March 8, 1872 (January 28, 1872 according to the calender of that time). From 1873 to 1897 accounting of domicile population was made by adjusting births, deaths and acquisition and loss of domiciles annually to the basic domicile population of 1872. Therefore, there is a possibility of two kinds of errors in succeeding domicile populations. The one is error which occurred in actual enumeration in 1872, the other one is error appeared in adjusting births, deaths and acquisition and loss of domiciles.

(b) Current population.

The domicile population is de jure population concerning the domicile; the current population is de facto population. The current population was calculated on the basis of the domicile population by adjusting regional migrations which could be known from temporary residence register. The current population includes at least the same kind of errors as the

domicile population because it is calculated on the basis of the domicile population. In addition, there are additional errors about migration data.

(c) An estimated population since 1872 by Bureau of the Census.

Bureau of the Census estimated populations since 1872 in order to obtain series of population data being consistent with the cnesus population. This estimation was made by using the actually enumerated population in 1872, the census population in 1920 and vital statistics.

(d) A new estimation of the pre-census population.

Formerly the author estimated populations by sex and age for the period 1870 - 1920.[2] The basic method of this estimation is shown in the following.

(1) The basic population on which the estimation is made is the first census population by sex and age, on October 1, 1920.

(2) The death rates were abnormally high in 1918 and 1920 because of influenza occurred in these years. Therefore such high rates should be considered as special cases. Estimation from 1920 to 1918 directly by using vital statistics.

(3) Starting from the population on January 1, 1918, every five year populations were estimated by method of reverse survival ratios.

(4) The survival ratios used in this estimation were calculated according to the method which Dr. Matsuura adopted in his work "Reformation of Japanese Pre-Census Life-Tebles" (Kyushu Journal of Medical Science, September, 1958).

In the following analysis author exclusively uses the estimated population for the pre-census period. The reason is that as it is shown in the next chapter, the trends of crude birth and death rates calculated on the estimated population reveal a much more plausible pattern than vital rates calculated on the other population.

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2) Okazaki Y., "Population Estimates by Sex and Age from 1870's to 1920", Research Series, No. 145 of Institute of Population Problems, Ministry of Health and Welfare, February 1, 1962.

CHAPTER II

THE DEMOGRAPHIC TRANSITION IN JAPAN -ESPECIALLY ON THE TREND OF FERTILITY-

According to the official data of vital statistics, crude birth rate was 25.3 per thousand of population in 1875, since then it gradually rised and reached at 31.7 in 1900, 33.9 in 1910 and 36.2 in 1920. Since 1920 it began to decline. On the other hand, crude death rate almost maintained the level of about 20 per thousand of population from 1875 to 1920. After that it declined.

If these official vital rates are reliable, the demographic transition in Japan, especially rising trend of birth rate, belongs to a special pattern, quite different from that of the West-European countries. Because the typical pattern in the demographic transition in the West-European countries is that birth rate remained almost unchanged during the early period of modernization. However, according to main opinion prevailing at present, the rising trend of the official birth rate during the early period of modernization in Japan is simply a reflection of improvement of vital registration. Rather the trend of birth rate is

considered to be declining.[3) 4)]

As mentioned above, author estimated populations by sex and age for the period 1870-1920 by using the first census

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3) Frumkin, G., "Japan's Demographic Expansion in the Light of Statistical Analysis, "Sociological Review, Vol. xxx No. 1, January, 1938.

Morita Y., "An Analysis of Japan's Population Increase during the Meiji Era. "Analysis of Population Increase, 1944, p.430.

Taeuber, I., "Japan's Demographic Transition Re-Examined, Population Studies, Vol. xiv, No. 1, July 1960, p.33.

Honda, T., "Re-Examination of Japan's Vital Rates before and after the Meiji Reformation, "Annual Report of Institute of Population Problems. Ministry of Health and Welfare, No. 6, 1961.

4) Recently the traditional model of the demographic transition is under revision as the result of a number of studies. According to those studies there is a considerable variability in the actual course of the demographic transition. And the rise in fertility in Japan during the early stage of industrialization is regarded as one example from the similar pattern. Cf. Current Sociology, The Sociology of Human Fertility, A trend report and bibliography, 1963, pp. 53 - 54.

population of 1920 and estimated life tables for the pre-census period. The result of this estimation makes it possible to calculate the birth rate and death rate during the period.

The estimated vital rates are shown in Table 4.

TABLE 4.

BIRTH RATE AND DEATH RATE
DURING PRE-CENSUS PERIOD

(per thousand)

Period	Birth Rate	Death Rate	Rate of Increase
1870-1875	36.3	31.3	5.0
1875-1880	36.4	31.3	5.1
1880-1885	33.9	28.3	5.6
1885-1890	33.7	28.1	5.6
1890-1895	34.3	27.3	7.0
1895-1900	36.3	27.0	9.3
1900-1905	35.2	24.2	11.0
1905-1910	37.0	25.3	11.8
1910-1915	35.6	22.1	13.5
1915-1920	33.2	22.3	10.9

Chart 1 shows the comparison of birth rates and death rates of new estimation, of Professor Morita's and of Mr. Honda's. Chart 2 shows the comparison of demographic transitions of Japan and England, Wales. There is a remarkable similarlity of demographic transition between Japan's and England, Wales, except following two points. The one is that the transition started in 1750 in England, Wales, it started in 1870 in Japan, the other one is that Japan spent only one hundred years for completion of the demographic transition while England, Wales spent two hundreds years.

Chart 1. VITAL RATES OF THE MEIJI ERA

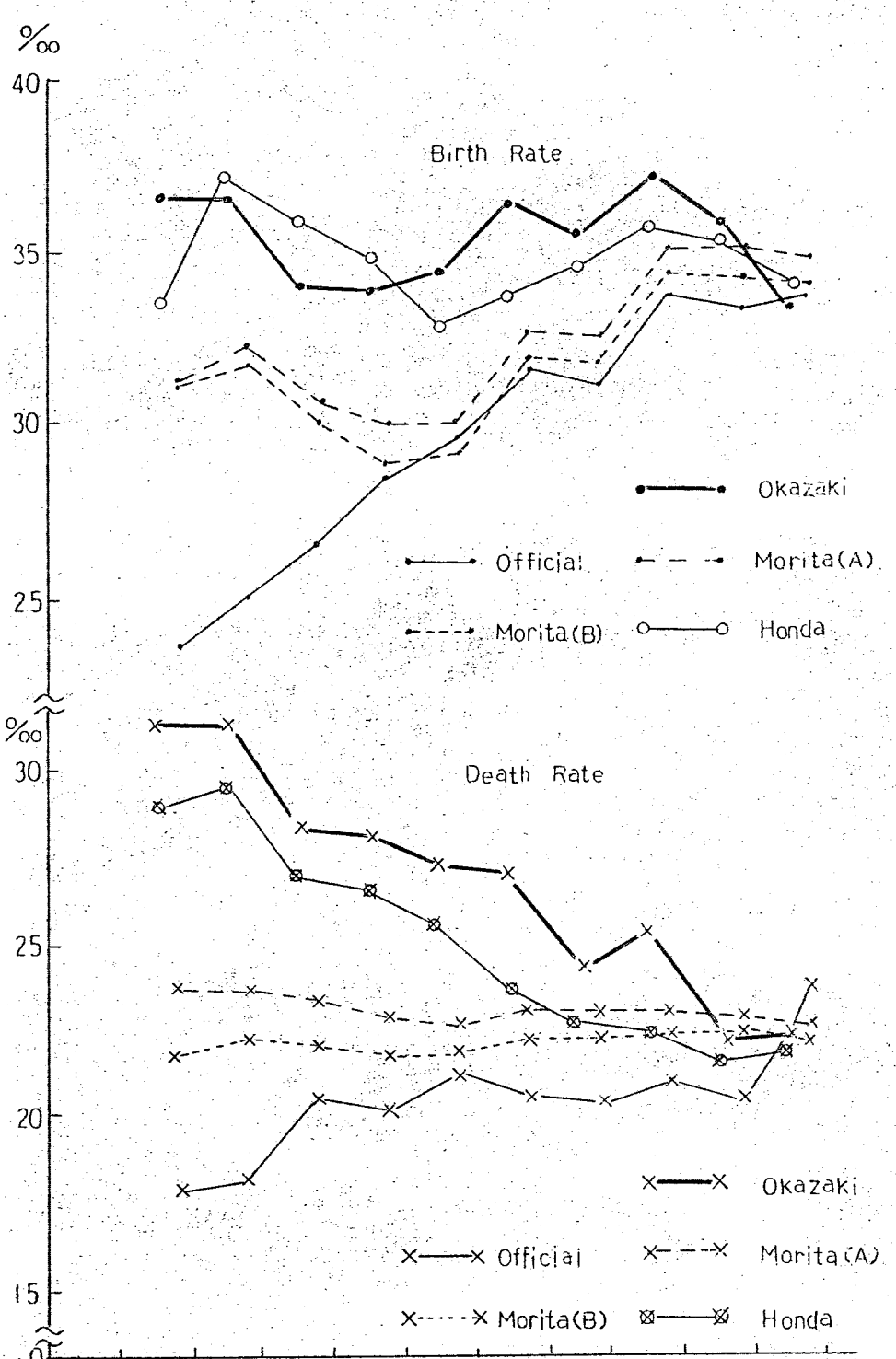
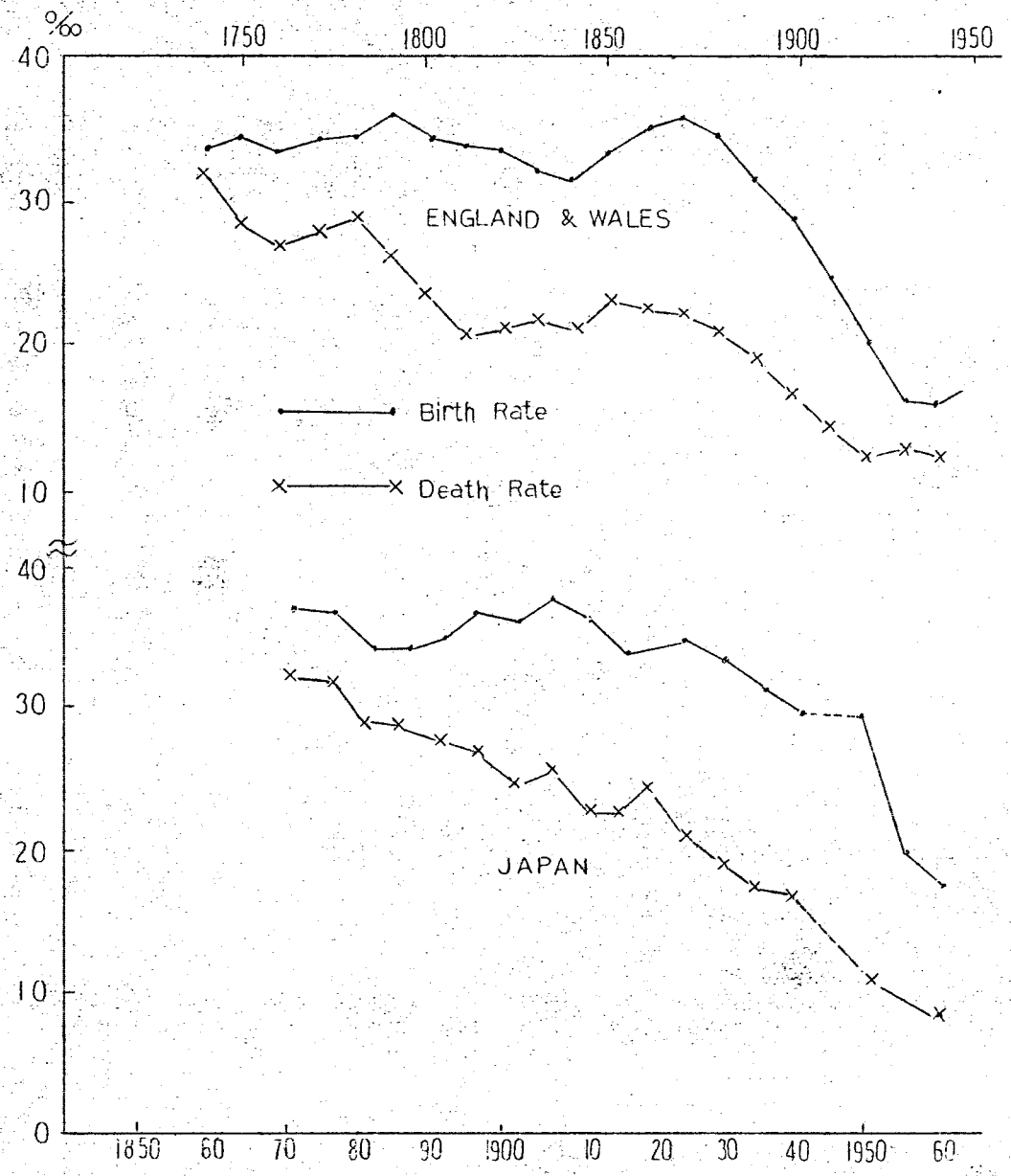


Chart 2. DEMOGRAPHIC TRANSITION OF ENGLAND·WALES AND JAPAN



CHAPTER III

THE DEMOGRAPHIC ANALYSIS OF THE TREND OF BIRTH RATE

This chapter is divided into two parts. In the first part trends of various indices of fertility are observed. In the second part the trend of birth rate is analysed from a view point concerning marriage rate and marital status.

1. Three kinds of birth rate and three kinds of reproduction rate.

The most simple index of fertility is the crude birth rate. As it is generally known this is a ratio of number of births to number of total population. Thus the crude birth rate is an index of fertility in terms of total population, regardless of its composition by sex and age.

A same kind of index can be considered and calculated in terms of total female population. This index might be named the female crude birth rate. If the sex ratio is constant the female crude birth rate moves in parallel with the crude birth rate. But in the case where change of sex ratio brings about different trend of these two crude rates, female crude birth rate reflects the fertility trend better than crude birth rate.

TABLE 5

CRUDE BIRTH RATE, FEMALE CRUDE BIRTH RATE
AND GENERAL FERTILITY RATIO

Year	C.B.R.	Female C.B.R.	G.F.R.	Year	C.B.R.	Female C.B.R.	G.F.R.
1875	35.5	74.6	157.8	1902	36.3	72.8	151.7
1876	37.6	77.1	163.6	1903	35.5	71.0	148.6
1877	36.8	75.3	160.5	1904	33.9	67.8	142.4
1878	36.0	73.6	157.4	1905	35.5	71.0	149.3
1879	35.8	73.1	156.9	1906	33.6	67.4	141.4
1880	32.1	65.5	140.7	1907	38.7	77.5	162.2
1881	34.0	69.2	148.3	1908	39.4	78.9	165.4
1882	33.2	67.5	144.1	1909	39.6	79.3	166.8
1883	35.9	73.0	155.6	1910	36.0	72.0	152.2
1884	34.7	70.4	150.1	1911	36.3	72.6	153.2
1885	31.8	64.3	136.9	1912	35.6	71.2	150.1
1886	32.4	65.5	138.5	1913	35.5	71.1	149.9
1887	32.6	65.9	137.8	1914	36.1	72.2	152.2
1888	35.8	72.4	150.7	1915	34.1	68.3	143.8
1889	36.7	74.1	153.8	1916	33.7	67.5	142.4
1890	34.3	69.2	143.1	1917	33.5	67.1	141.5
1891	32.3	65.2	134.4	1918	32.8	65.7	138.4
1892	35.7	72.0	147.8	1919	32.3	64.7	135.4
1893	34.6	69.7	142.8	1920	36.2	72.6	152.5
1894	35.3	70.9	144.8	1921	35.1	70.5	148.6
1895	35.0	70.3	143.3	1922	34.3	68.9	145.2
1896	35.6	71.5	146.2	1923	35.2	70.6	148.9
1897	36.8	73.9	151.4	1924	33.9	68.2	143.5
1898	37.4	75.0	154.2	1925	34.9	70.2	147.8
1899	37.5	75.3	155.5	1926	34.9	69.6	147.2
1900	34.9	69.8	144.6	1927	33.4	67.2	141.9
1901	36.5	73.2	151.9	1928	34.1	68.6	144.9

TABLE 5

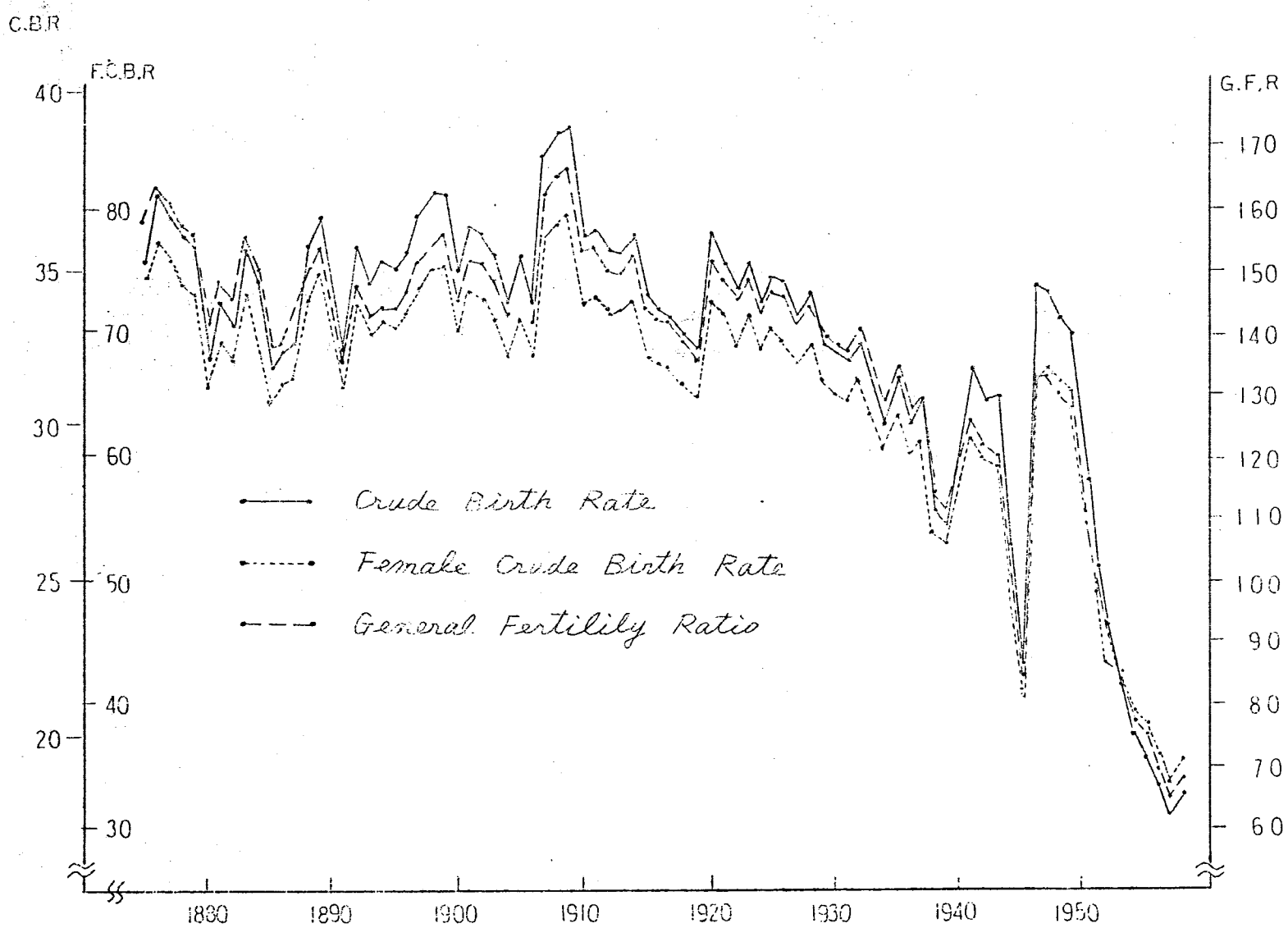
(continued)

Year	C.B.R.	Female C.B.R.	G.F.R.	Year	C.B.R.	Female C.B.R.	G.F.R.
1929	32.7	65.8	138.9	1947	34.3	67.0	132.6
1930	32.4	65.0	137.4	1948	33.5	65.6	130.0
1931	32.1	64.6	136.7	1949	33.0	64.7	128.5
1932	32.9	66.0	140.1	1950	28.1	55.1	109.8
1933	31.5	63.2	134.5	1951	25.3	49.6	98.5
1934	29.9	60.1	128.2	1952	23.4	45.9	90.6
1935	31.6	63.5	134.7	1953	21.5	42.2	82.9
1936	30.0	60.0	127.2	1954	20.0	39.4	74.2
1937	30.9	61.4	129.9	1955	19.4	38.1	74.3
1938	27.2	53.7	113.1	1956	18.4	36.3	69.9
1939	26.6	52.6	110.0	1957	17.2	33.8	64.5
1940	29.4	57.9	120.4	1958	18.0	35.3	66.8
1941	31.8	61.6	126.8	1959	17.5	34.4	64.5
1942	30.9	59.5	121.7	1960	17.2	33.8	63.5
1943	30.9	59.1	119.9	1961	16.9	33.1	62.5
1944	☆25.8	☆49.0	☆100.3	1962	17.0	33.4	62.2
1945	☆21.8	☆41.2	☆ 83.3	1963	17.3	33.9	62.1
1946	☆34.6	☆66.2	☆132.1	1964	17.7	34.7	62.7

Source: For the period 1875-1919, Ōkazaki's estimation; after 1920, the official vital statistics, census population and official estimated population.

Note: The figures for 1944, 1945, 1946 are a little unreliable because of some disturbance by war.

Chart 3. CRUDE BIRTH RATE. FEMAILE CRUDE BIRTH RATE AND GENERAL FERTILITY RATIO



Another index of fertility of the same kind as crude birth rate and female crude birth rate is the general fertility ratio calculated as ra tio of number of births to number of women of child-bearing age, 15 - 49. General fertility ratio is a purer index of fertility than female crude birth rate.

In Table 5 figures of crude birth rate, female crude birth rate and general fertility ratio are indicated and they are illustrated in Chart 3. Number of births of every year was calculated by distributing number of births in every five year group of new estimation to each year according to proportion of the official data of births. Number of total population and childbearing age women were calculated by linear interpolation of new estimated population.

From examination of the table and the chart the following results were obtained.

(1) All three crude birth rates fluctuated but did not show any definite declining trend during the period 1875 - 1920. Since 1920 they all began to decline. The extent of decline was 52.5 per cent (from 36.2 in 1920 to 17.2 in 1960) for crude birth rate, 53.5 per cent (from 72.6 in 1920 to 33.8 in 1960 for female crude birth rate and 58.4 per cent (152.5 in 1920 to 63.5 in 1960 for general fertility ratio.

(2) As it is shown by following equations,

$$\frac{B}{P} = \frac{B}{P} \times \frac{P^f}{P}$$

$$\frac{B}{P} = \frac{B}{P_{15-49}} \times \frac{P_{15-49}}{P}$$

B : Number of births

P : Number of total population.

P^f : Number of female population.

P_{15-49} : Number of women of child bearing age.

a factor which explains the gap between change of crude birth rate and that of female crude birth rate is the change of sex ratio, and a factor which explains the gap between crude birth rate and that of general fertility ratio is the change of proportion of women of childbearing age.

(3) Female crude birth rate is more close to true index of fertility than crude birth rate is, and general fertility ratio is much more close than crude birth rate. Thus fertility of Japan declined during 1920 - 1965 at more than that extent which crude birth rate indicated. The decline of crude birth rate was mitigated by rise of the proportion of female population in total population; and rise of the proportion of childbearing age women in total female population.

Various reproduction rates are indices which represent trend of fertility more exactly, with less disturbance of sex-age composition, than crude birth rates described above.

In Table 6 and Chart 4 total fertility rate, gross reproduction rate and net reproduction rate during the period 1920 - 1965 are presented.

Total fertility rate and gross reproduction rate declined by almost equal proportion, by 54 per cent, during this period. because gross reproduction rate is equal to the total fertility rate multiplied by the sex ratio of babies, and because there is little change in this ratio, it is natural that movement of total fertility rate and gross reproduction rate were parallel.

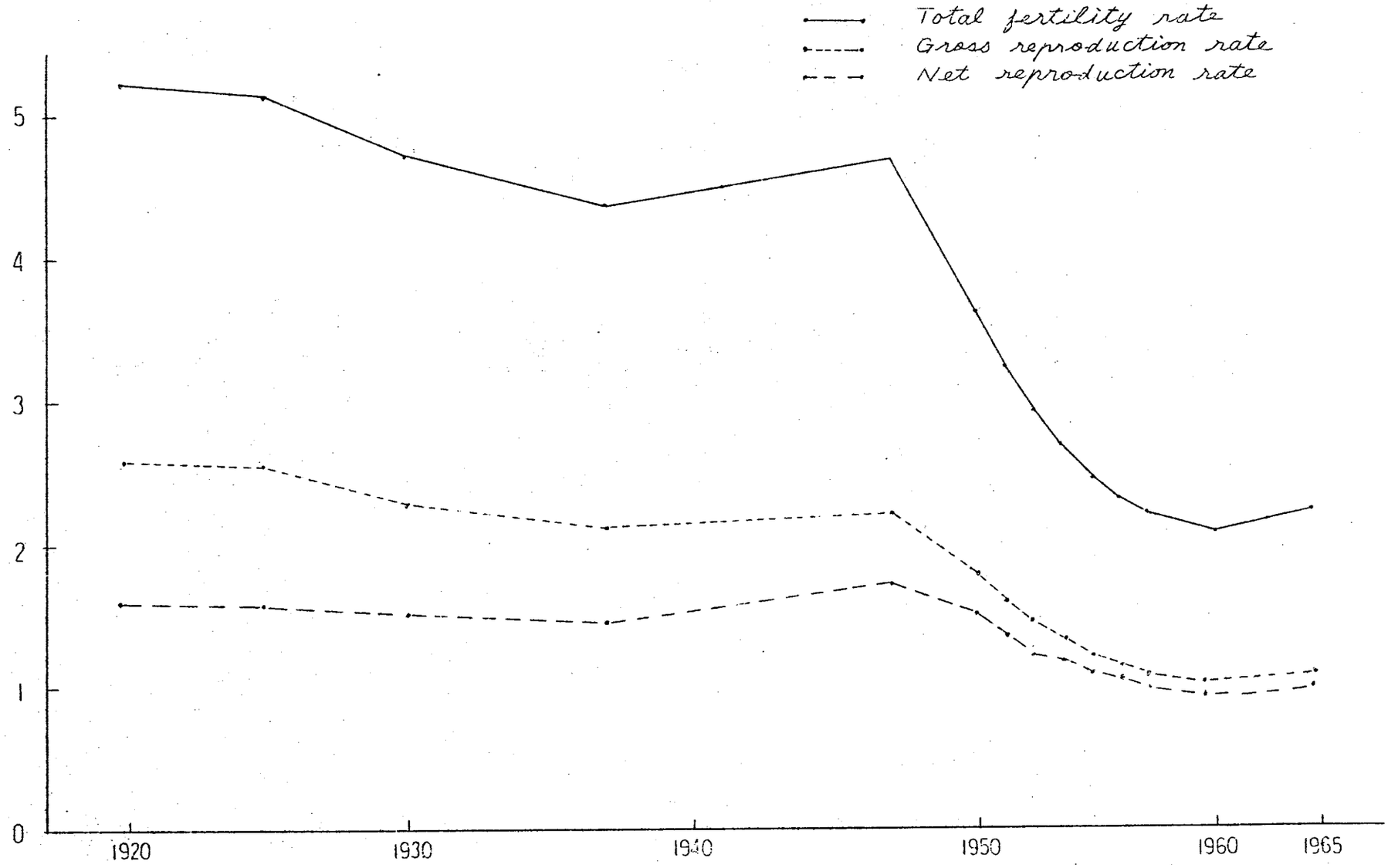
On the other hand, the extent of decline of net reproduction rate was definitely smaller than that of gross reproduction rate. That is, net reproduction rate declined 37.1 per cent, while gross reproduction rate declined 59.4 per cent. This difference is explained by the fact that the survivorship of population in childbearing age rised over this period. Thus, the undisguised effect of fertility decline which is not disturbed by effect of mortality decline is indicated by decline of gross reproduction rate.

TABLE 6

Year	T.F.R.	G.R.R.	N.R.R.
1920	5.24	2.56	1.59
1925	5.11	2.51	1.56
1930	4.71	2.30	1.52
1937	4.36	2.13	1.49
1940	4.11	2.01	1.44
1947	4.52	2.20	1.67
1950	3.63	1.76	1.53
1951	3.24	1.58	1.38
1952	2.96	1.45	1.28
1953	2.68	1.31	1.17
1954	2.47	1.20	1.09
1955	2.36	1.15	1.05
1956	2.21	1.07	0.99
1957	2.03	0.99	0.91
1958	2.10	1.02	0.96
1959	2.03	0.99	0.92
1960	1,99	0.97	0.92
1961	1.95	0.95	0.90
1962	1.97	0.95	0.91
1963	1.99	0.97	0.93
1964	2.04	0.99	0.95
1965	2.13	1.04	1.00

Source: K. Yamaguchi, Trends of Population Reproductivity, 1966.

Chart 4. TOTAL FERTILITY RATE, GROSS REPRODUCTION RATE, AND NET REPRODUCTION RATE



2. Analysis of birth rate from the aspect of marriage rate and marital status.

In Japan most of births are legitimate births. During the Meiji era the proportion of illegitimate births to total births was about 9 per cent, but it declined steadily. It was 4 per cent in 1940, 2 per cent in 1953 and 1.4 per cent in 1958. Therefore it is signigicant to analyse the trend of birth rate with relation to marriage rate, although there is a problem originated from delay of marriage notification.

In Table 7 and Chart 5 the trends of birth rate and marriage rate are indicated. A feature which is pointed out in these materials is that there is an almost perfect parallelism during the period 1900 - 1935 between birth rate and marriage rate; that after 1935, especially after 1950 the parallelism has disappeared. The correlation coeffecient between birth rate and marriage rate is 0.676 for the period 1900 - 1935, while it is 0.257 for the whole period 1900 - 1958.

As mentioned above there were considerable number of illegitimate births during the Meiji era. If we take this fact into consideration and amend the data, the parallelism would be higher during 1900 - 1920.

Now if we concentrate our attention to the long-run trend of birth rate and marriage rate, we can see that birth rate declined about 50 per cent during the same period. This fact seems to suggest that the decline of birth rate is independent from the trend of marriage rate. However, before getting conclusion we should examine relationship between birth rate and proportions of women married.

TABLE 7

CRUDE BIRTH RATE AND MARRIAGE RATE

Year	Birth	Marriage Rate	Year	Birth	Marriage Rate
1900	34.9	7.9	1919	32.3	8.7
1901	36.5	8.6	1920	36.2	9.8
1902	35.5	8.2	1921	35.1	9.2
1903	35.5	8.2	1922	34.3	9.0
1904	33.9	8.7	1923	35.2	8.8
1905	35.5	7.6	1924	33.9	8.7
1906	33.6	7.6	1925	34.9	8.7
1907	38.7	9.2	1926	34.6	8.3
1908	39.4	9.7	1927	33.4	7.9
1909	39.6	9.1	1928	34.1	8.0
1910	36.0	9.0	1929	32.7	7.8
1911	36.3	8.7	1930	32.4	7.9
1912	35.6	8.5	1931	32.1	7.6
1913	35.5	8.4	1932	32.9	7.8
1914	36.1	8.7	1933	31.5	7.2
1915	34.1	8.5	1934	29.9	7.5
1916	33.7	8.1	1935	31.6	8.0
1917	33.5	8.3	1936	30.0	7.8
1918	32.8	9.2	1937	30.9	9.5

TABLE 7

(continued)

Year	Birth Rate	Marriage Rate	Year	Birth Rate	Marriage Rate
1938	27.2	7.6	1952	23.4	7.9
1939	26.6	7.8	1953	21.5	7.8
1940	29.4	9.3	1954	20.0	7.9
1941	31.8	11.0	1955	19.4	8.0
1942	30.9	9.4	1956	18.4	7.9
1943	30.9	10.2	1957	17.2	8.5
1944	-	-	1958	18.0	9.0
1945	-	-	1959	17.5	9.1
1946	-	-	1960	17.2	9.3
1947	34.3	12.0	1961	16.9	9.4
1948	33.5	11.9	1962	17.0	9.8
1949	33.0	10.3	1963	17.3	9.7
1950	28.1	8.6	1964	17.7	9.9
1951	25.3	7.9			

Source: Health and Welfare Statistics Division, Vital Statistics, 1964, Vol. 1.

The proportion of women married in childbearing age, 15 - 49, declined steadily from 1920 to 1955 and thereafter it slightly increased, as it is shown in Table 8.

TABLE 8

PROPORTION OF WOMEN MARRIED IN CHILDBEARING AGE

Year	Proportion married	Year	Proportion married
1920	68.3%	1950	58.6%
1925	68.0	1955	57.4
1930	65.8	1960	58.4
1935	64.1	1965	59.5
1940	61.4		

Source: Bureau of Statistics, Population Census.

The changes of proportion of married women in each five-year age group between 1920 and 1955 are illustrated in Chart 6. The proportion of married women declined in every age group in childbearing ages. On the other hand, it rose in higher age groups, mainly because old age female mortality was relatively improved.

The rate of decline of proportions of women married was higher the age was lower. That is,

Age group	Rate of decline of proportion married
15 - 19	89.8%
20 - 24	49.8
25 - 29	11.2
30 - 34	4.8
35 - 39	5.6
40 - 44	5.0
45 - 49	1.1

Source: Chart 6.

On the other hand, the changing pattern of age specific fertility of married women was different as it is shown in Chart 7. It should be noted that because age specific fertility are available only from 1925, the comparison in this chart is

Chart 5. TRENDS OF BIRTH RATE AND MARRIAGE RATE

Chart 6 PROPORTION OF WOMEN MARRIED BY AGE GROUPS

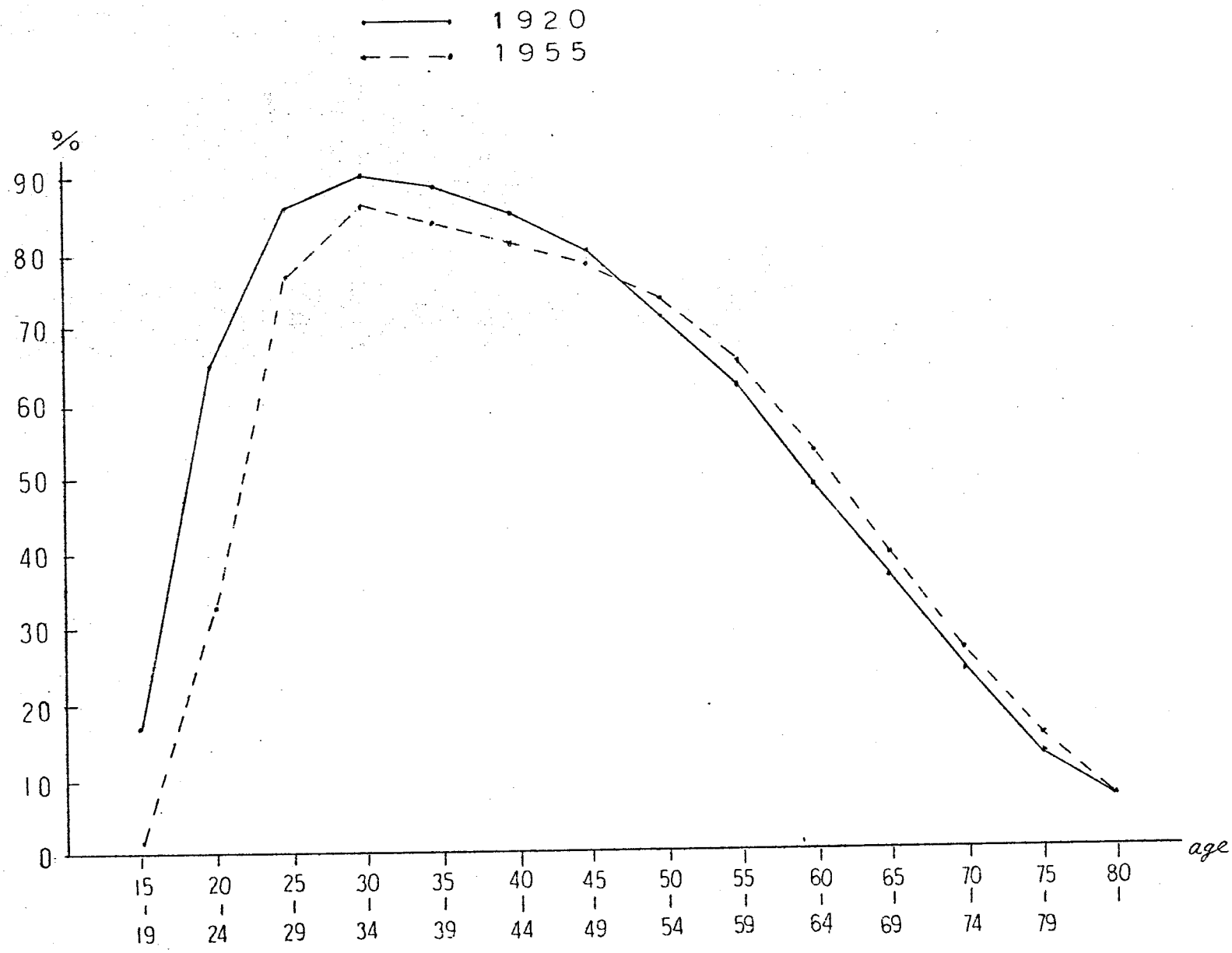
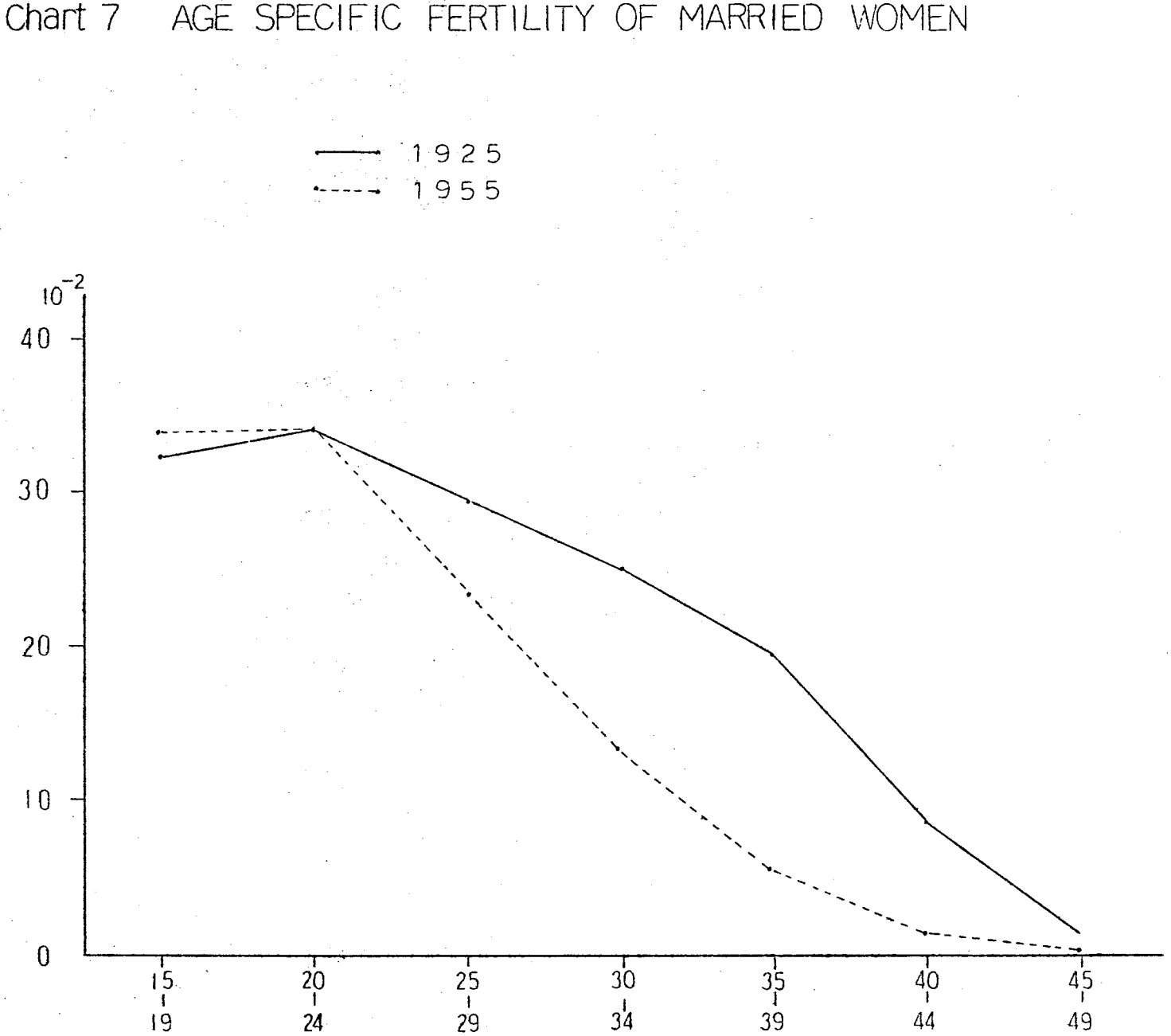


Chart 7 AGE SPECIFIC FERTILITY OF MARRIED WOMEN



made not as for 1920 - 1955 but as for 1925 - 1955. The point which this chart makes clear is that fertility declined definitely in upper childbearing ages while it remained almost unchanged in lower childbearing ages.

Crude birth rate was 34.9 per thousand of population in 1925, it was 19.4 in 1955. Thus crude birth rate declined 44 per cent in these thirty years. Three factors can be considered to contribute to this decline. The first one is the decline of age specific fertility, the second one is the decline of proportion of married women and the third one is the change of age distribution of female population.

If we calculate a crude birth rate, using 1925 proportions married, 1925 age distribution of female population and 1955 age specific marital fertility, we have some assumed crude birth rate of 1925, that is, 24.6 per thousand of population. The difference between the actual birth rate and the assumed birth rate, 34.9 - 24.6 10.3 means the pure effect of decline of marital fertility. Similarly we can calculate another assumed crude birth rate of 1925, using 1955 proportions married, 1925 age distribution of female population and 1925 age specific marital fertility. The result is 26.2 per thousand. The difference, 8.7 per thousand, between the actual

and the assumed birth rates means the pure effect of the decline of proportions married. Finally the pure effect of change of age distribution is -4.6 per thousand. Thus, the decline of marrital fertility reduced the crude birth rate by 29 per cent, the decline of proportions married reduced it by 25 per cent and the change of age distribution raised by 13 per cent.

The result of the similar calculation made on the basis of 1955 data is that the decline of marital fertility reduced the birth rate by 58 per cent, the decline of proportions married reduced it by 46 per cent and the change of age distribution raised by 15 per cent. In this case the actual rate of decline of crude birth rate is 80 per cent ((34.9 - 19.4) - 19.4).

The folllowing table is the summary of the preceding calculation.[5)]

One important conclusion derived from the preceding calculation is that the change of proportion married contributed to the decline of birth rate to almost same extent as the change of marital fertility did.

Finally authour should point out an interesting point.

The childbearing age female population can be divided into two groups. One is a group aged 15 - 24, the other is

TABLE 9

SUMMARY TABLE

1925		1955	
Actual Rate:	34.9	Actual Rate:	19.4
Assumed Rate:		Assumed Rate:	
1925 Proportions married 1925 Age distribution 1955 Marital fertility	24.6	1955 Proportion married 1955 Age distribution 1925 Marital fertility	30.6
1955 Proportions married 1925 Age distribution 1925 Marital fertility	26.2	1925 Proportion married 1955 Age distribution 1955 Marital fertility	28.3
1925 Proportion married 1955 Age distribution 1925 Marital fertility	39.5	1955 Proportion married 1925 Age distribution 1955 Marital fertility	16.4

5) The gap between difference of actual crude birth rates and sum of the differences of actual and assumed crude birth rates can be explained by the following.

F : Marital fertility.
M : Proportion married.
P : Age distribution.

$F \times M \times P$: Crude birth rate at one point of time.

$(F+\Delta F)(M+\Delta M)(P+\Delta P)$: Crude birth rate at the other point of time.

(1) $\frac{(F+\Delta F)(M+\Delta M)(P+\Delta P) - F \times M \times P}{F \times M \times P}$: Actual rate of change of crude birth rate

(2) $\frac{(F+\Delta F) \times M \times P - F \times M \times P}{F \times M \times P}$

(3) $\frac{F \times (M+\Delta M) \times P - F \times M \times P}{F \times M \times P}$: Assumed rate of change of crude birth rate

(4) $\frac{F \times M \times (P+\Delta P) - F \times M \times P}{F \times M \times P}$:

$$(2)+(3)+(4)-(1) = \frac{F \times \Delta M \times \Delta P + \Delta F \times M \Delta P + \Delta F \times \Delta M \times P}{F \times M \times P}$$

This makes the gap which is under consideration

a group aged 25 - 49. We call the former Group A, the latter Group B.

Crude birth rates of Group A, that is the number of births of A group divided the number of women in A group, was 0.127 in 1925 and 0.059 in 1955. The rate of decline is 53.5 per cent. As for Group B, it was 0.160 in 1925 and 0.083 in 1955. The rate of decline is 48.1 per cent.

Although the rate of decline of birth rate is almost same in each group, the factor contributing to decline is quite different between two groups. That is, the proportion married in Group A was 38.1 per cent in 1925 and 17.0 per cnet in 1955. The rate of decline is 55.4 per cent. On the other hand, the proportion married in Group B was 86.5 per cent in 1925 and 80.6 per cent in 1955. The rate of decline is only 6.8 per cent.

The marital fertility in Group A was 0.333 in 1925 and 0.346 in 1955. It rised 3.9 per cent. On the other hand, the marital fertility in Group B was 0.185 and 0.103 in 1955. It declined by 44.3 per cent.

Thus, we can conclude that the decline of birth rate was mainly due to decline of proportion married in A group aged 15 - 24, but it was mainly due to decline of fertility in B

group aged 25 - 49.

Table 10 is the summary table of this calculation about two groups.

TABLE 10

SUMMRY TABLE

Year	1925	1955	Rate of decline
Brith rate:			
Group A ;	0.127	0.059	53.5 %
Group B :	0.160	0.083	48.1
Proportion married:			
Group A ;	0.381	0.170	55.4
Group B ;	0.865	0.806	6.8
Marital fertility:			
Group A ;	0.333	0.346	-3.9
Group B ;	0.185	0.103	44.3

Similar calculations for 1950 - 1965 were made and presented in the Journal of Population Problems, No. 100, January 1967. The results are shown in Table 11 indicating that contribution of marital fertility decline was large to crude birth rate decline in ten years from 1950 to 1960, contribution of change of proportion of married women was relatively small and effect of female age composition change was small but opposite. In addition, for the crude birth rate increase which occurred from 1960 to 1965 for the first time in the postwar period, almost same degree of influences of rise of marital fertility and increase of proportion married were found and there was a relatively small contribution of age composition change. (Cf. The Journal of Population Problems, No. 100, January 1967, p. 70).

TABLE 11 SUMMARY TABLE

Fertility rate	1950 - 60		1950 - 55		1955 - 60	
	1950 base	1960 base	1950 base	1955 base	1955 base	1960 base
Actual crude birth rate	28.10	17.20	28.10	19.38	19.38	17.20
Assumed crude birth rate						
(1) Proportion married: base year; Age composition: base year; Martial fertility: Observed year	18.46	27.77	20.67	26.88	17.08	19.75
(2) Proportion married: Observed year; Age composition: base year; Marital fertility: base year	25.66	19.42	25.77	21.47	19.21	17.39
(3) Proportion married: base year; Age composition: Observed year; Marital fertility: base year	30.10	16.16	29.20	18.60	19.90	16.86

Fertility rate	1950 - 65		1955 - 65		1960 - 65	
	1950 base	1965 base	1955 base	1965 base	1960 base	1965 base
Actural crude birth rate	28.10	18.54	19.38	18.54	17.20	18.54
Assumed crude birth rate						
(1) Proportion married: base year; Age composition: base year; Marital fertility: Observed year	19.12	29.26	17.71	20.66	17.82	17.89
(2) Proportion married: Observed year; Age composition: base year; Marital fertility: base year	26.43	20.35	19.78	18.16	17.73	17.97
(3) Proportion married: base year; Age composition: Observed year; Marital fertility: base year	30.78	17.27	20.23	18.05	17.35	18.40