Labor Market, Public Policies and Fertility of Japanese Women*; Analyses of Municipal Data

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Abstract

First we constructed a Weighted Fertility Rate index using the Census Data that can serve as a good proxy for TFR for municipalities for which TFR data are not available on a regular basis. We then applied the standard specification that had been widely used to account for the changes in TFR, using WFR index as our dependent variable. Our estimation result shows that weakening preference for children is gradually coming to an end after year 2000, but the decline in fertility experienced during 2000-2005 have come from labor market, including the increased female labor force participation, and the increased uncertainty in the employment for younger male workers. Compared with the existing studies, the increased data size, the reduction in community heterogeneities, and the better quality of Census Data of our study seem to have produced more precise estimation results.

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Labor Market, Public Policies and Fertility of Japanese Women: Analyses of Municipal Data

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1. Introduction

During the last thirty five years, Japan has experienced a rapid decline in the number of child births, from 2.09 millions in year 1973 to 1.06 millions in year 2005. Total fertility rate of Japanese women dropped from 2.16 in 1971 to 1.26 in 2005 during this period (Fig.1). As a result of this rapid decline in the fertility, many Japanese public institutions are still under serious attack on their credibility, most notable examples are public pension programs and public health insurance programs that have been leaving huge costs for the future generations to bear. In retrospect, it is not the magnitude of the decline alone, but more the precious time lost as the government had continued to live in denial for almost another 10 years, that has led to the collapse of Japanese social insurance programs we are observing today.

The first fertility shock was felt in late 1989 when the news media started to report that the TFR is about to decline very substantially. It actually fell to 1.57, contradicting the optimistic scenario of government recovering toward replacement level of 2.0 as predicted by the optimistic scenario of the government. The government

The timing of the fertility shock could not have been worse. It slightly antedated the arrival of the “bubble economy” that eventually collapsed after a few years. In fact, it is quite possible that “bubble economy” had contributed to the initial decline in fertility, by greatly expanding labor market opportunities for women, particularly college graduates. Once the real estate market collapsed, so did the credit market. Even the major banks and many major corporations find themselves suddenly on the brink of business failure.

In the long economic crisis that followed the collapse of the bubble, large firms abandoned the renowned Japanese management model en masse, particularly the practice of lifetime employment. They began firing middle-age workers before the mandatory retirement age, and when they needed more workers as business eventually turned better, they either hired younger, part-time workers or relied to temporary employment agencies.

As a result of this change in the corporate hiring policy, now one out of three Japanese workers is a part-time worker. Looking back to 1994, there were 38.1 million regular workers, and 9.7 million part-time workers. In 2007, however, there are 33.9 regular

workers, and 17.2 part-time workers. Admittedly two-thirds of the part-time workers are female, but even for men, in 1994, there were 26.4 million regular workers and 2.4 part-time workers, but, in 2007, there are only 23.9 million regular workers and 5.4 part-time workers. Those who entered into the labor market since 1990 saw their economic fortune considerably sour compared with their predecessors.

In 1996, the government ended its denial, and started to work on measures to help recover the fertility. Most of the measures they introduced since then have concerned women, particularly working women, and children. Exempting the social insurance fees for women during their maternity leaves, providing more substantial cash grants for children, providing more nursery schools are these examples. In spite of these measures, however, during this so-called "lost decade" after the burst of the bubble, the fertility continued its decline until it reached 1.31 in 2005. Most who had analyzed the fertility decline, including the present authors, concluded that the decline is due to the changes in women, particularly in education and work. All this time, the role of young male workers on the decline has been ignored.

When TFR went up for the first time last year in almost two decades, however, the Ministry of Health, Labor and Welfare explained that the upturn was due to the increased hiring of younger male workers as regular employees, who in turn got married and had children. In the remainder of this paper, we are going to find out how much of the decline in fertility since 1995 is due to the labor market conditions, particularly young men and women in the prime of reproductive ages. Our preliminary work suggests that indeed in the decline in fertility during the last five years, the job uncertainty of young male workers had been most important.

2. Survey of Japanese Literature using Micro Data or Regional Data

Since prefecture-level macro economic data is far more accessible than micro household data, there are a considerable number of studies on prefecture TFR. Ogura-Dekle (1992) were first to analyze the prefecture TFR data, combining them with Census data for 1970, 1975, 1980 and 1985. They concluded that higher wage for female, higher education for female, and higher land price reduced TFR. Later **Yoneya** (1995) analyzed cross-section data of prefectures, and found that wage for female workers, education cost, and housing rents are negatively correlated with TFR.

One of our concerns is the relation between TFR and public policies. There are many public policies in Japan designed to which may affect TFR. **Harada-Takata**(1991) have estimated that 5,000 yen child grant will increase fertility by 0.006, based on the income

parameter of the fertility rate equation they have estimated using 1985 prefecture cross section data. Later, **Yashiro** et al (1997) have argued that, on the basis of their multinomial logit estimation using a national micro-data, more than 60 % of infant cohort have to be accommodated into nursery schools in order to achieve the medium fertility level in the official population projection. Using municipal TRF data of 2002, **Kitamura-Miyazaki** (2003) have found that the cash gift for wedding from municipal government for newly wedded couples, practiced mainly in depopulated areas, increased the marriage rate and hence fertility. More recently, **Higuchi et al** (2007) have estimated a bi-variate probit model of wife's job and birth, and found that the capacity of municipal nursery school has a significant positive coefficient only for the first child, but not the second child. Incidentally, in our analysis, as a proxy of all public policies designed to stimulate fertility, we focus exclusively on child welfare expenditure of the municipal government. The reason is that all the costs of child welfare policies are summarized in this measure, and almost all municipalities have reported this figure.

3. Prefecture Total Fertility Data

Since it is very difficult to obtain large micro-data sets on family structure, the next best thing for us to do is to analyze the regional differentials in fertility behaviors. The most frequently used fertility rates are total fertility rates and the most common regional units in statistical analysis are prefectures. There are 47 prefectures and each prefecture is given a number with Hokkaido, the most northern island, as the 1st, and Okinawa, the most southern island, as the 47th. The National Institute of Population and Social Security Research publish prefecture TFR data every year. In Fig. 2, we show prefecture TFR's for census years since 1985, and in Fig. 3 we show four years of prefecture TFR data since 2003.

Historically, there has always been a substantial variation across prefectures in terms of TFR. Most conspicuous has been the relatively low fertility rates in prefectures that contain such large cities as Sapporo, Sendai, Tokyo, Kyoto, Yokohama, Osaka, Kobe and Fukuoka compared with their surrounding prefectures. There are many factors in living in large cities that can reasonably lead to low fertilities.

For one thing, due to expensive housing costs, most married couples live within a very limited space, and, adding another member to the family can immediately produce tensions to the existing members. Secondly, most couples live far from workplace, and long commuting hours make it almost impossible for husbands to share the obligations of raising children. Thirdly, many of the young parents have come from smaller cities during

colleges, and it is difficult to get help from the grandparents of infants. Fourthly, with respect to public nursery schools, in capital areas usually it has been extremely difficult to place their infants in those facilities, and, a couple has to choose between a job and taking care of her baby. For a wife to continue to work usually involves placing her baby in an expensive, but often low-quality, private nursery facility. Fifthly, the systematic disparities between big cities and smaller ones do not end there, but continues up to public high schools. Most big cities have admission capacity far less than half of the junior high school graduates, that helped develop strong but far more expensive private school system, while smaller cities accommodate most of the academically qualified students in their public schools.

These factors are, albeit to varying degrees, common to most big cities in the world, but Japan has been particularly susceptible to their effects due to its continuous population concentration.

Why then have most of the statistical works based on prefecture data failed to produce conclusive evidences on this reasonable conjecture? The problem has been in the data themselves; in each prefecture, we find considerable heterogeneities within most factors that affect fertility. For instance, typically, in most prefectures outside major metropolitan areas, there is a considerable concentration of population in its capital, but the rest of the prefecture is sparsely populated. As a result, we have the same “congestion” problem within a prefecture, and in the capital area, the housing costs can be several times more expensive, and other costs of living can be far more expensive, than the rest of the prefecture. There are only 47 prefectures, and given the heterogeneities, and the available statistical information, it has been very difficult to produce high quality statistical work based on prefecture panel data.

4. Normalized Weighted Fertility Rate Index

In our empirical work, we want to utilize far more variation in the explanatory variables in municipal data than is available in prefecture data. Prior to 2002, there used to be 3300 municipalities (i.e. cities, towns and villages), and after the Great Merger of 2002, there are still almost 2500 of them. Many of the data necessary for our statistical work are available only for census years, but it is a small price to pay if we get 40 times or more observations.

What should we choose of the fertility data? In general, demographers regard TFR as an ideal index for the measurement of fertility, and apparently annual municipal TFR data are available. On a national level, or even on a prefectural level, we agree that TFR should be the strongest candidate for our left hand side variable. For small towns or cities, however, it may be a very different story. In a small town, for instance, a few births this year may drastically increase the town's TFR if there are only a few women in particular age groups, but they are almost sure to depress it next year. How do they compute TFR if there are no women at some ages? Almost by definition, TFR for a small population will be very volatile over time, and what we have as municipal TFR may not have come from vital statistics without a lot of assumptions.

An obvious alternative to TFR is the simple fertility rate which is the ratios of the number of children born in a given year to the total number of women in reproductive ages. In principle, the data for numerator is available in Vital Statistics, and the data for denominator is available either in National Census or Resident Directory Statistics. The drawback of the simple fertility ratio is also quite well-known, as fertility is can be quite sensitive to the age composition of women population.

For this reason, we have constructed a normalized weighted fertility rate index for our dependent variable. Its numerator is the total number of children born in a given year in a community as in the simple fertility rate computation, but our denominator is the expected number of children to be born there if all the women in the community had followed child-bearing pattern of an average Japanese woman at any given age observed in a base year. We have chosen year 1995 as our base year, because it is the mid-point of our five census years. If in a given year, before or after 1995, the women in the community happen to follow an identical reproductive behavior to their national counterparts of 1995, the ratio will be one. If all of them are twice more reproductive, the ratio will be two. If we are sure that relative incidences of child-bearing remain the same across ages, we would know that our normalized WFR index multiplied by national TRF figure of 1995 gives a good estimate of its true TFR value.

On the other hand, the relative incidences of child-bearing across ages can be substantially different in a town from the 1995 national pattern, even though the two have identical TFR values. In this case, unfortunately, our normalized WFR index can give a value that is either greater than one or less than one. This is an undesirable property for a proxy of TFR. We do not know, a priori, how well our weighted fertility rate approximates the TFR, nor can we test it directly on municipalities since TFR data are not available for them.

So we have tested it on the prefecture data for which TFR data are available. In order to avoid complications due to difference in the base of computation in Japanese vital statistics, we have chosen the following short-cut; for the number of new born children, rather than using the Vital Statistics figure, we have taken the weighted average of population who are 0 year old and population who are one year old. Since the Census is conducted on October 1, we have given a weight of 0.75 to the 0 year old and 0.25 to the 1 year old.

In Figure 4, we have shown the five scatter diagrams between the log of prefecture TFR's and the log of weighted fertility rates for the last five census years, 1985, 1990, 1995, 2000 and 2005. Note that except for 2005, the two are aligned almost perfectly on a straight line. In fact, for these four census years, a simple regression of log of TFR on log of 1995 WFR index gives a coefficient of 1.019 (sd=0.009) and a R squared value of 0.9845, while for the year 2005, the coefficient of log of WFR drops to 0.9579 (sd=0.040) and to an R squared value of 0.9245. So there is some evidence of structural change, but for the rest of this paper, to keep our analysis as simple as possible, we will still treat the 1995 WFR index as a good proxy of TFR for all these years including 2005. For all of the five census years, the coefficient of log of 1995 WFR index is 1.034 (sd=0.0148) and a R2 of 0.9534. In what follows, we assume that the same holds for municipalities as well.

There is no doubt that many economists would be very interested in municipal TFR data. They would be able to find out, for instance, how much variation in municipality there is in Japan, how they have changed over the years, and what are the characteristics of high TFR towns/cities or low TFR towns/cities. Our Table 1 shows the municipal variation in WFR data within Tokyo Metropolitan Area.

5. Model and Data Sources

5.1 Model

The model we are going to estimate is a standard linear model given by

$$y_{it} = \alpha_i + \sum_j^J \beta_j x_{ijt}$$

where y_{it} is the log of an index of fertility rate of community i in year t, and x_{ijt} is the jth factor of community i in year t.

The explanatory variables have been chosen so as to include all the important factors associated with the costs of raising children are captured. Overall there are four such groups of factors; namely, (1) labor market factors, (2) housing market factors, (3) public support for children, and (4) family structures (other than labor market factors).

Labor Market Factors

Among labor market factors, the most important is the opportunity cost of mother's time spent in raising children. Many variables can work as a good or reasonable proxy for this cost, including mother's education, female wage rates, and female labor force participation rates. The second factor is the income of families who want to start having children. In a traditional society where a husband is expected to be the main bread-winner, male wage rates or some household income index will serve as income variables. We will use the tax-base of the local income tax as a proxy of the family income. Also there are important public policies relieving women of the social insurance premiums during, and some period after, their maternity leaves.

Housing Market Factors ,

As everyone knows, children consume considerable space and the relative price of space can be an important limiting factor in the demand for children. Land price should serve as a good proxy for this cost. Since land price data is available only for the last three censuses, we will use population density as a proxy for the housing cost.

Public Support for Raising Children

While Japanese government spends relatively smaller amount for children compared with what they spend for the elderly, several programs have grown in its importance in relieving the child-raising costs or adding to the family income for families raising children.

- Availability of nursery school or day-care center services

- Partial or total payments of out-of-pocket costs of children's health care
- Cash grants for families with small children

Family Structures

If a couple has a support from their parents in looking after their children when they need it, raising children can become less costly and much safer. In this sense, multi-generation family structure is expected to be more child-friendly. Also, if women can look after their children while earning some income, it should lower the opportunity cost of women's time spent for raising children. It is often pointed out that self-employed families have this advantage, because they work and they live in the same places, and they have flexible working environments to meet the demands of child-cares.

5.2 Data Sources

Dependent Variable

The number of children born within one year of the census of year t is denoted by $Ebaby_{it}$ and it is precisely zero (0) year old population of the community; namely,

$$Ebaby_{it} = P_{it}(0),$$

where $P_{it}(k)$ is the population of k year old in community i in year t. Assuming every women follow the average reproductive behavior of Japanese female observed in year 1995, the expected number of children born in the community $E95baby_{it}$ is given by

$$E95Baby_{it} = \sum_{k=15}^{49} r95_k F_{it}(k),$$

where $r95_k$ is the birth rate of Japanese women at age k in 1995 and $F_{it}(k)$ is the community's female population of age k in year t.

Our dependent variable is $WFR95_{it}$ which is the ratio of $EBaby_{it}$ to $E95Baby_{it}$, or

$$WFR95_{it} = EBaby_{it} / E95Baby_{it}.$$

In other words, $WFR95_{it}$ shows how many times more babies the female population of the community is producing than are expected from the national average of the year 1995.

Independent Variables

- ***Child Welfare Expenditures*** is a normalized per-capita measure of municipal government expenditure for child. It is a ratio of the municipal government's total

expenditure for child welfare to the hypothetical number of babies to be born, or E95Baby. We note that we used this normalization to avoid the endogeneity problem if we had used actual number of babies born in the community in the denominator. The municipal government's total expenditure for child welfare typically includes such items as the costs of running public nursery schools, the cash grants to families with small children, and partial or total reimbursements of out-of-pocket payments of health care services for small children. The source of this data is the Survey of the Financial Statements of Local Government compiled by Ministry of Home Affaires every year.

- ***Per Capita Income*** is a proxy for personal income. More precisely, we have taken the reported tax base figure of the personal local income tax contained in the Survey of Financial Statements of Local Governments, and divide it by the number of residents who are at age 15 or older. Then we normalize this income divided by 1995 based GDP deflator
- ***Normalized Male Unemployment Rate*** measures how many times more risk of unemployment a male of a given community faces who are in the child-bearing generation. Its numerator consists of a community's weighted male unemployment rate. More precisely, starting from age 20~24, and up to age 45~49, we have computed the unemployment rates of each age-class in the community. We then give each age-class a weight equal to the female fertility rate of 1995 and compute the weighted male unemployment rate. The denominator of the ratio, on the other hand, consists of the hypothetical unemployment rate of the community if the unemployment rate in the community is identical to the national average in each age-class, and each age-class is given the same 1995 fertility weight.
- ***Normalized Female LF Participation Rates*** measure how many times more it is likely for a female of a given community to be working if she is in the child-bearing age. Its numerator consists of a community's weighted male unemployment rate. More precisely, again, starting at age 20~24, and up to age 40~44, we have computed the LFP rates of each age-class in the community. We then give each age-class a weight equal to the female fertility rate of 1995, and compute the weighted female LFP rate. The denominator of the ratio consists of the hypothetical weighted LFP rate of the community, if the LFP rate in the community is identical to the national average in each age-class, and each age-class is given the same 1995 fertility weight.
- ***Nuclear Family Ratio*** is the ratio of the number of nuclear households to the sum of all types of households in each municipality.

- ***Self-Employed Worker Ratio*** is computed as follows; first, we obtained the number of workers in the self-employed business by adding the number of self-owned business owners and their workers in owner's family, and then we divided this number by the population of each municipality.

For this paper, we had to drop the variable for the availability of nursery school service, because many municipalities have been missing values of the nursery school capacities and including the variable would have resulted in a substantial loss of observations. Also, as the Census has started to include the number of unemployed individuals since 1990, given the present formulation, we have used only the last four census data (1990, 1995, 2000 and 2005) for our estimation.

5.3 Data structure and excluded data

There were 2,238 municipalities in Japan on October 1, 2005, the day 2005 Census was taken. We have constructed a panel data of these 2,238 municipalities for the five census years since 1985. As is well-known, there were a large number of mergers among municipalities during the first five years of the twenty first century. If town A, town B and town C merged to form a new city D in year 2002, for example, in our data, we have only data for City D for 1985, 1990, 1995, 2000 and 2005. So, in principle, our panel data would be a balanced panel data. But, in our census, some data are missing systematically for some regions. In our data, all municipalities in Chiba prefecture for year 1985 are not accounted for, and all municipal data in Hyogo prefecture for year 1995 are not accounted for due to the aftermath of "Kobe Earthquake". Likewise we had to exclude all Miyake village data. We also excluded 6 municipalities in Akita prefecture in 2005 because of missing value.

5.4 Descriptive Statistics

Our Table 2 shows the descriptive statistics of these variables, including those used to compute the ratios that appear on both sides of our regression. Here WFRindex stands for $WFR95_{it}$.

The next table, Table 3, shows how the means of these variables have changed over the years. One can see if there is a "time trend" for each variable. It is clear that "WFRindex", "ln(WFR index)" and "Self-Employed Ratio" have downward trends, while the rests have upward trends. Especially, we note that the increase in "Male Unemployment Ratio" is steep during the 2000-2005 period: it was 0.324 in year 2000, which went up to 0.502 in

year 2005.

6. Estimation Results

The results of our regression estimation are given in Table 4. The first two columns give the results of OLS, pooled cross-section regressions. The first column of the table gives the coefficients of equation (xxx) with year dummies while the second gives the coefficients of the equation without year dummies. Third column gives the more interesting results as it gives the estimated coefficients of fixed effect model.

In the first column, at first, it looks as though we have gotten almost all of we have hoped for. Child welfare expenditure increased the fertility, but young male worker's job insecurity (unemployment rate) reduced the fertility much more substantially. The largest effect seems to have come from Labor Force Participation by women in the prime of child-bearing ages. The only oddity in the result, unfortunately, is the very significant negative coefficient of household income, which suggests the possibility that our estimation might be suffering from the insufficient controls. In fact, in our own experience, negative coefficients for income variables are quite common in regressions using Japanese prefecture data. They are usually a sure sign of insufficient controls for the problems of large cities that have very low fertility and much higher nominal income. Lastly, coefficients of year dummies indicate that our baseline fertility has been declining continuously during the 1990 to 2005 period.

The second column suggests that, if we remove the year dummies, two changes will take place: one, self-employed ratio emerges as a significant positive factor of fertility, and, two, Labor Market Participation of child-bearing age females exerts an even greater negative influence on fertility. But this model also seems to suffer from negative coefficient problem of family income proxy variable. The simple specification of our model can be particularly susceptible to the missing variable problem.

In view of this problem, therefore, in the third column, we have turned to the fixed effect model. This estimation gives a very different picture of what has happened during this period.

First of all, household income is no longer statistically significant.

Secondly, the Self-Employed Ratio is no longer significant.

Thirdly, the coefficient of the Nuclear Family Ratio is negative, statistically significant,

and it is three times as large as the cross section estimate.

Fourthly, the coefficient of Female LFP ratio is negative, statistically significant, and almost two times as large as the cross section estimate.

Fifthly, the negative effect of labor-market uncertainty for young male workers has been reduced to less than one-half of the cross-section estimation.

Fifthly, the child welfare expenditures is still very significance, but the size of the effect is very small, and less than one-third of the cross section estimate...

Lastly, as to the (unexplained) changes in fertility, from year 2000 to year 2005, actually we have had only a relatively small decline.

7. Discussion and Concluding Remarks

What can we learn from our estimation? Using the coefficients obtained from Table 4, we have decomposed the changes in our WFR index in the table5. Please note that the following decompositions are based on sample means, and they are not population weighted.

(1) We can see in the first row (Total Changes) of the table that the fertility declined at the rate of 1% per year during 1990-1994 period, and the decline has accelerated to 1.6% per year during 1995-1999 period. During the 2000-2004 period, almost the same rate of decline continued. Thus apparently the decline has not eased at all.

(2) If we look at the second row, however, in the 1995 to 1999 period, the unexplained factors (namely, coefficients of year dummies) contributed about 1% per year decline, but in the third period, its contribution dropped to only 0.7% per year.

(3) The third row reveals, moreover, that the explained factors are increasing their contributions to the total changes. During the second period, the changes in regression factors almost cancelled each other out, but in the third period, they managed to contribute a 0.5 % per year decline. In the forth period, they have contributed almost a 0.8% per year decline, more than the unexplained factors.

Probably most of the “unexplained” changes in the estimation reflect the reduced preferences for children as they are not controlled at all in the regression. Then it appears that the reduced preference for children was dominant during 1990 ~ 1999 period, but after year 2000, the effect seems to be losing steam. For the first time during the last twenty years, more than half of the decline since year 2000 can be attributed to the changes in economic factors. Labor market participation of young women

contributed significantly to the decline, but the most important factor was the labor market uncertainty surrounding young men during the period.

Public policies during the last two decades have focused mostly on women and children. Also public policies have focused on securing the jobs for the elderly. In fact, Genda(2003) has maintained that the preferential treatments of the elderly are depriving the economic opportunities of the younger workers, particularly male workers, which may have a serous negative implication for the skill formation of this generation that can handicap the economic performance of our country for a long time. It seems that the economic deprivation of younger men and women who are reduced to "part-timers" without adequate protections from social insurance programs has yet another far-reaching effect, in the continued stagnation of Japanese fertility.

A good news, however, is that with the massive retirement of baby boomers in the next few years, to replace them, firms are bound to start hiring the young male workers. This could turn the economic fortunes of younger male workers around completely, and remove the negative pressure on the Japanese fertility. In fact, in the last fifteen years, public policies have provided far better environment for mothers to raise their infants. If better economic times are secured for younger generations, we may start to see gradual recovery in fertility for the next decade or so.

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Figure 1. TFR and Crude Birth Rate of Japan Since 1985

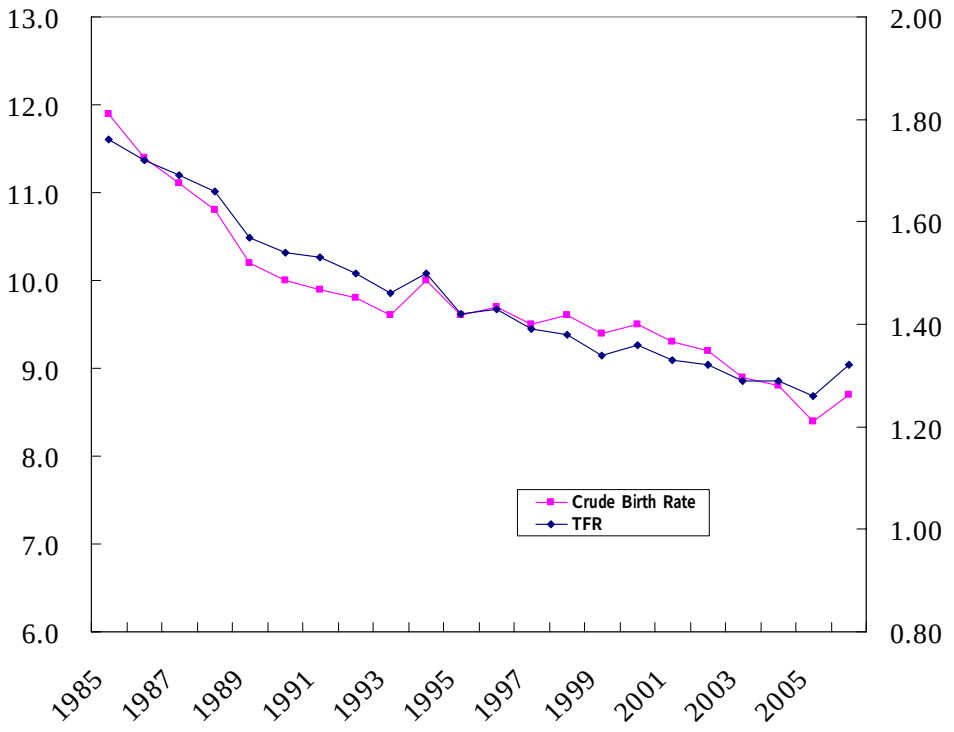

Figure 2. Prefectural TFR in Census Year

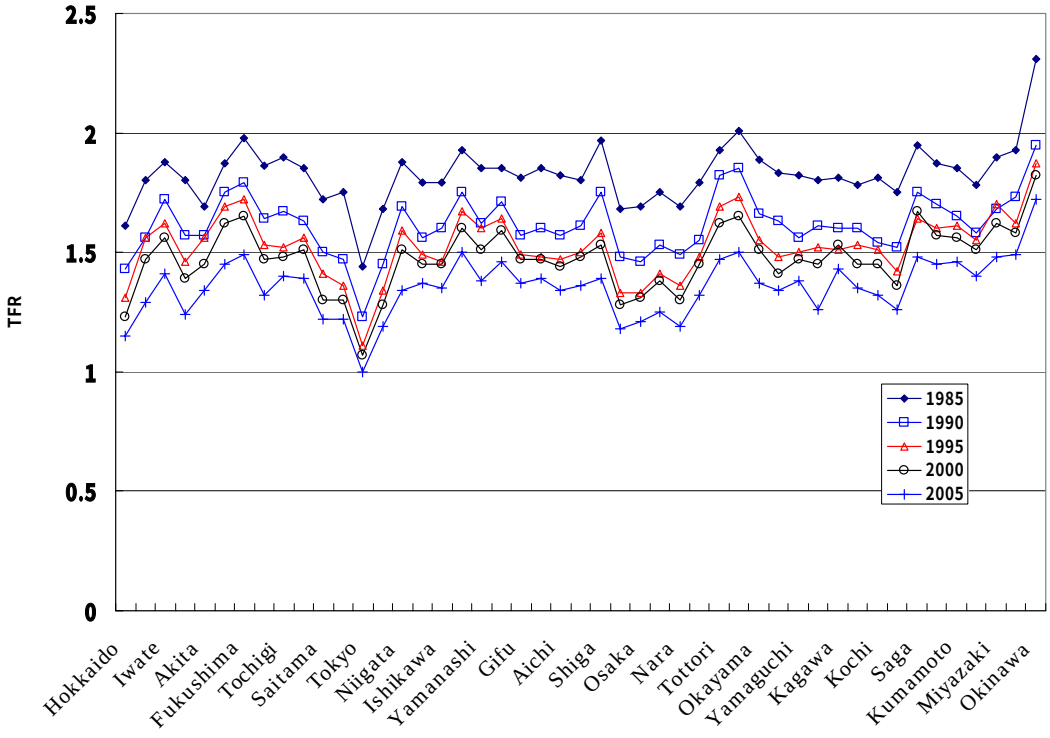

Figure 3. Prefectural TFR since 2003

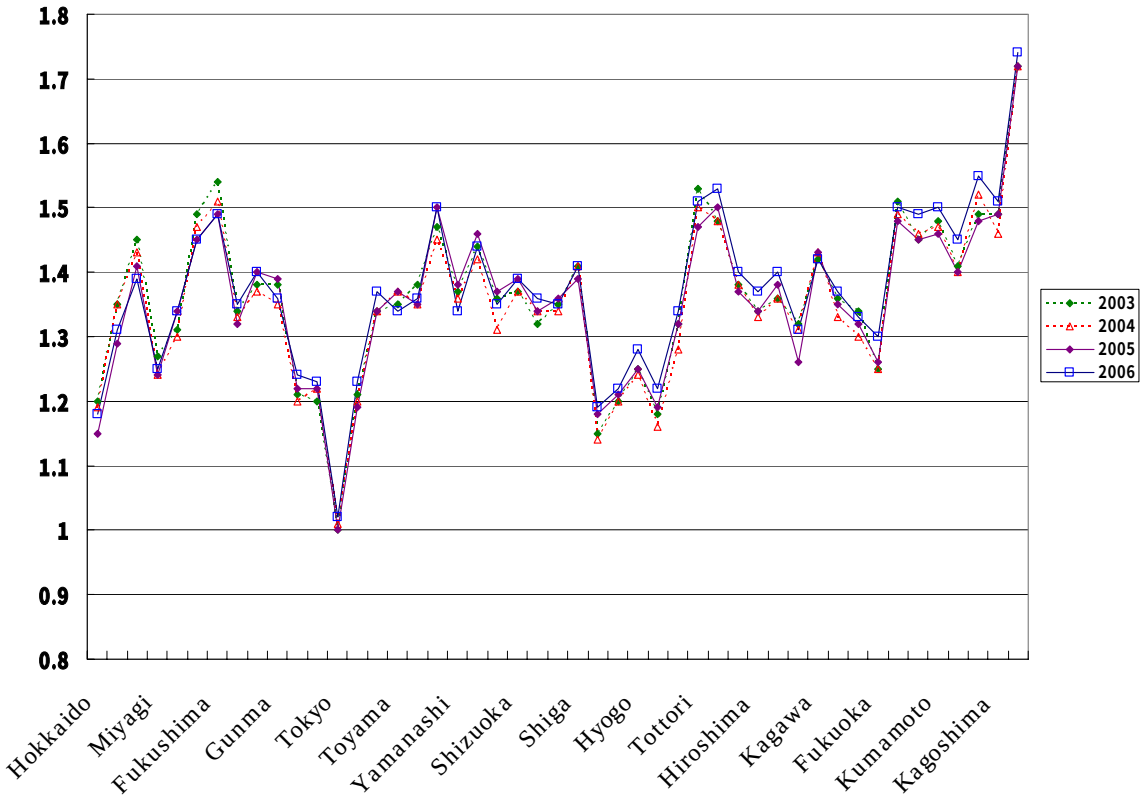

Figure 4. Five years log of TFR(y) and log of WFRidx95(x)