ども数に対する希望の経年変化を描いたものである。図1は既婚者のみの回答で、2子、3子を希望する人の割合が突出している。70年代後半から80年代後半にかけて3子希望が2子希望を上回ったが、90年代には2子選好が盛り返している。

図2は出産力調査のデータであるが、夫婦の平均予定子ども数と未婚者の希望子ども数がほぼ一致している。このことから、未婚者の希望子ども数は非現実的な値ではなく、自分が結婚したとき実際もてるであろう子ども数を表していることが読み取れる。このデータによると、第7回（1977）から現在まで大きな変化はなく2.0人を超えているが、細かく見れば第9回（1987）をピークに漸減していることがわかる。

もう少し詳しく見てみよう。図3a、3b、3cは結婚持続期間別夫婦の平均理想子ども数、平均予定子ども数、平均生存児数であるが、理想子ども数が結婚持続期間が長くなるほど微増するのに比べ、予定子ども数は結婚期間を通じてあまり変わらない。おおよそ2.1くらいで推移しており、戦後から現在の平均的な子ども需要は2人でほぼ安定しているとみてよい。まだ予定子ども数を達成していない0〜4年、5〜9年カップルの出生過程には近年少し遅れが見えているが、予定子ども数は今までとあまり変わらない2.1前後であるので、子ども需要の減退は認められない。

こうしてみると、昔も今も、予定子ども数は大きな変化がないといえそうである。ただし、前近代社会では消費・所得・年金効用のために子どもが需要され、近代社会では消費効用のために子どもが需要されるのである。

3.2 子ども需要のゆくえ—第11回出生動向基本調査データを使った分析

さらに、第11回出生動向基本調査を使って、年齢別、社会経済的属性別の理想・予定子ども数にどう違いが出るかを見てみよう。まず、表1は妻の現在年齢別に理想・予定子ども数(割合)を見たものである。これによると、理想子ども数は34歳未満と35歳以上ではっきり分かれ、高年齢になるにしたがって3人を理想子ども数とする人の割合がもっとも大きくなる。これは、実際に出産･子育てを経験するうちに子ども観が変化していくことを表す。近年は老後の不安感が大きいことから、老後保障としての子どもの価値が高年齢になるにしたがって意識され、理想子ども数が増えている可能性もある。しかし、予定子ども数となるとどの年齢層でも2人が最大グループとなり、理想と現実のギャップを表している。理想子ども数より予定子ども数が少ない夫婦は、その主な理由として、34歳までの若年層では子どもの養育・教育費の問題、35歳以降ではお金の問題のほかに高齢出産忌避を挙げている。

上述のように、若年層では子どもにはお金がかかるというマイナス面が強く意識され、出生意欲に影響を及ぼしていることがわかるが、一方、若年層ではその若さゆえに身体的条件が良く、子ども需要が喚起される面もある。表2は妻の現在年齢別・現存子ども数別に追加予定子ども数を見たものであるが、34歳未満では現存0人であと2人、1人であと1人生む意欲を持つものが多数を占めるが、35歳以降は追加0人が最大グループとなる。女性にとって35歳という年齢が出産に関する一種のリミットと意識されていることがわかる。ただ、30〜34歳層では、現存0人、1人でもう生まない人の割合が高まっている。晩婚化によって結婚生活に入る年齢が高まると、0人、1人選好が高まるかもしれない可能性をうかがわせる。全体として、実際の出生力動向に影響が大きい20〜34歳層では、子ど

もの養育・教育費の問題から出生意欲が抑えられる一方、年齢のゆえに出産意欲は高い。生物学的要因によって出産が避けられる高齢層よりも、環境改善によって出生力が回復する余地が残っている。

次に、社会経済的属性別の理想・予定子ども数をみて、どのような属性が出生意欲に影響が大きいかを分析する。調査データから探ることができるのは、居住地、学歴、職種、年収、親との同別居である。ここで、夫の職種、年収では属性別にはっきりとグループ化できるような差異はみられなかった。

居住地では、表3によると、非DID（非人口集中地区）で理想子ども数が3人の割合が高く、あとは2人希望に移る。人口集中の規模が大きくなるにしたがって2人割合が高まり、3人割合が減り、非DIDに比べて1人の割合も高くなる。全体として、やはり都市化は出生意欲にもマイナスの影響を及ぼすことがわかる。

妻の学歴別理想・予定子ども数は表4に示されているが、高学歴になるほど2人が最多割合を占める。高校までは理想子ども数は3人だが、高専・短大以上の学歴ではそれが2人になる。予定子ども数でも、最多割合はどの学歴でも2人であるが、その数字を見ると、高学歴ほど2子予定割合が高まり、3子が減っている。また、高学歴ほど2子に集中しており、準拠集団志向が強いことも伺われる。

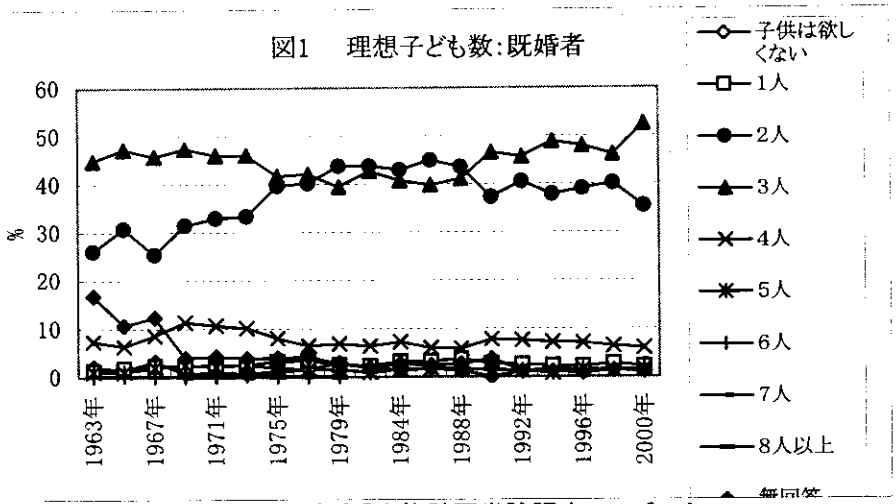
妻から見た親との同別居については表5a、bにまとめてある。理想子ども数は3人が最多であるが、自分の父親との同別居以外は、親と同居している方が出生意欲が高い。また、夫の父母と同居している方が、3子を希望する割合が高い。また、予定子ども数では最多割合が2子にそろってくるものの、夫の父母との同居では3子の割合が別居より同居で高くなっている。自分の父母との同別居で同居より別居の方が出生意欲が高いのは、別居が夫方の父母との同居を一部反映しているからと考えられる。夫方の父母との同居が理想・予定子ども数を高める理由ははっきりとわからないが、子どもを期待される雰囲気の問題などが考えられる。この点の分析は興味深いので次回の課題としたい。

表6は妻の結婚直後の従業上の地位別理想・予定子ども数割合である。これによると、予想に反して正規職員として就業している妻の出生意欲と、無職・家事の妻の出生意欲は同水準である。妻が自営業主・家族従業者の場合にもっとも出生意欲が高い。これによると、女性が社会進出したために自分のキャリアの都合で子ども需要が少なくなっているのではなく、出生意欲はあるが仕事と家庭の両立の問題が原因となっていることが伺われる。

全体を概観すると、夫婦の子ども需要はほぼ2子で安定している。都市化、高学歴化、晩婚化、核家族化の進行によって2、3子希望割合が漸減し、無子や1人希望が微増する可能性が示唆されるが、無子が最大希望グループになるとは考えにくい。問題は、3子予定者の大幅減と1子予定者の増加の可能性である。都市化や結婚年齢上昇が進むとこの可能性が高まることが予想される。また、高学歴化は2子規範を強める方向に作用しそうである。親との同別居は、核家族志向が高まっている現在では予定子ども数を上昇させる作用は弱い。女性の就業は出生意欲を減退させる傾向はあまりみられないが、仕事と家庭の両立という問題が出生過程の遅れを引き起こし、消極的少子化に結びつくかもしれない。子ども需要においては、ひとりっ子への忌避感が強い日本では2子がひとつの臨界線となっており、理想子ども数は2〜3人で推移していくと思われる。問題は実現可能性の高い子ども需要データである予定子ども数であるが、これが2を割ることはデータから見ても当分なさそうである。しかし、都市化、高学歴化、女性の社会進出、晩婚化、核家族化の進展

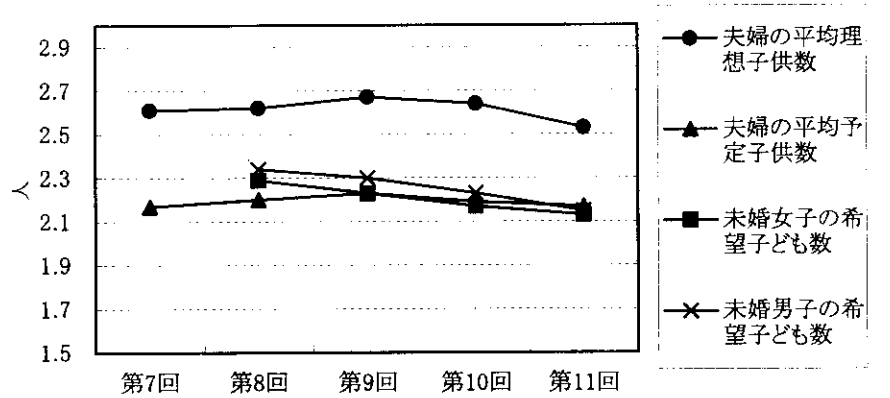
といった動きは現在も進行中であり、これから予定子ども数が漸減する可能性はある。特に、近年の日本の少子化は晩婚化が大きな要因になっており、データからも結婚年齢の上昇は無子や1人希望者の割合を高めることがわかっているので、もっとも注目する必要がある。

図1　理想子ども数:既婚者



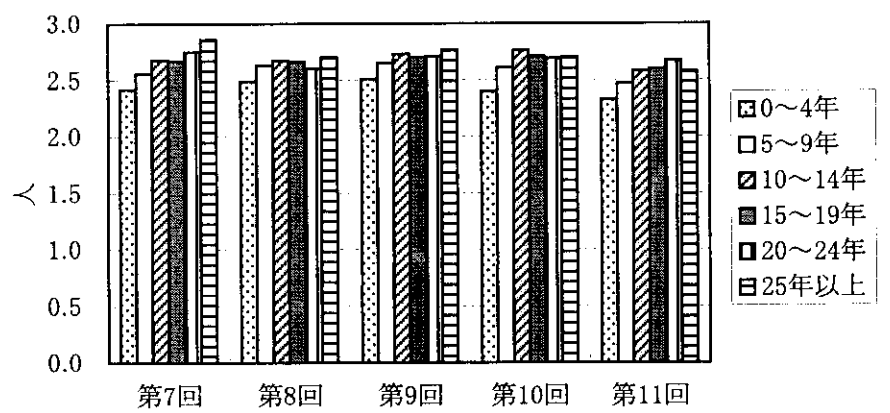
資料:毎日新聞社人口問題調査会「家族計画世論調査」FDデータ、2000。

図2　夫婦・未婚者の子ども数に対する希望



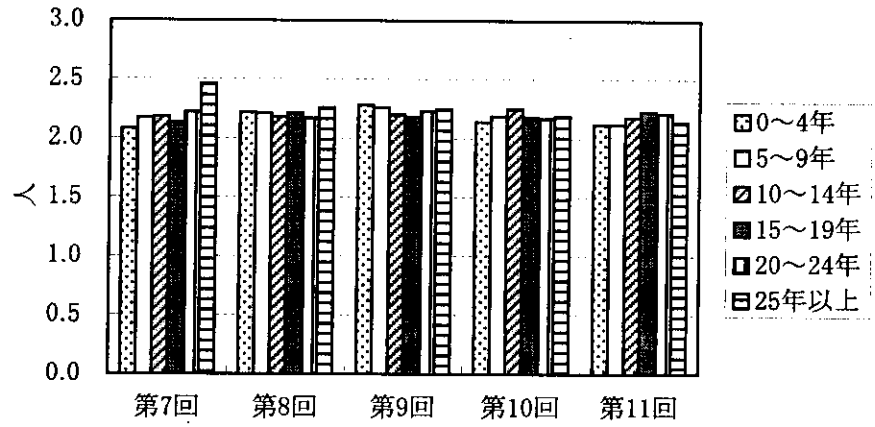
資料:国立社会保障・人口問題研究所、「第11回出生動向基本調査:結婚と出産に関する全国調査・夫婦調査の結果概要」

図3a　結婚持続期間別夫婦平均理想子ども数



資料:図2に同じ。

図3b　結婚持続期間別夫婦平均予定子ども数



資料：図2に同じ。

図3c　夫婦平均生存児数

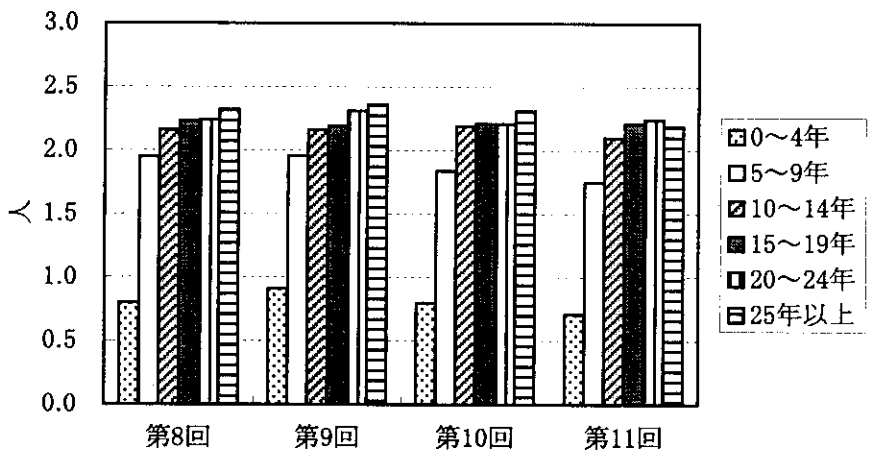


表1　妻の現在年齢別理想・予定子ども数(割合)　　%

妻年齢		理想子ども数・予定子ども数							
		0人	1人	2人	3人	4人	5人以上	不詳	合計
15－19	理想		8.3	41.7	**50.0**				100.0
	予定		8.3	**50.0**	41.7				100.0
20－24	理想	2.6	7.0	**53.5**	29.8	2.6	3.1	1.3	100.0
	予定	2.6	9.2	**57.5**	26.3	0.4	1.8	2.2	100.0
25－29	理想	1.4	5.1	**51.2**	35.9	3.6	1.0	1.8	100.0
	予定	1.8	7.9	**62.9**	21.7	2.3	0.5	2.8	100.0
30－34	理想	2.2	3.3	**46.7**	37.4	5.8	1.0	3.5	100.0
	予定	3.0	7.6	**57.5**	23.5	2.8	0.3	5.2	100.0
35－39	理想	2.3	3.6	41.2	**42.1**	6.3	1.3	3.1	100.0
	予定	5.1	10.5	**52.8**	23.5	3.2	0.6	4.4	100.0
40－44	理想	2.5	2.5	38.0	**44.6**	7.6	1.1	3.8	100.0
	予定	6.3	9.2	**50.9**	24.3	2.8	0.3	6.1	100.0
45－49	理想	2.5	2.4	36.0	**44.6**	7.0	0.9	6.6	100.0
	予定	8.6	10.7	**47.3**	19.1	2.0	0.3	12.1	100.0
合計	理想	2.3	3.3	**41.7**	41.3	6.2	1.1	4.0	100.0
	予定	5.4	9.4	**53.2**	22.4	2.5	0.4	6.6	100.0

資料:第11回出生動向基本調査・夫婦データ。

表2 妻の現在年齢・現存子ども数別、追加予定子ども数(割合・現存0～3子)　　%

妻年齢	現存子ども数	追加予定子ども数						合計
		もう生まない	あと1人	あと2人	あと3人	4人以上	不詳	
15－19	0		**42.9**	28.6	28.6			100.0
	1		20.0	**80.0**				100.0
20－24	0	8.9	15.6	**53.3**	18.9	2.2	1.1	100.0
	1	11.4	**61.0**	22.9		1.9	2.9	100.0
	2	**50.0**	**50.0**					100.0
	3	**100.0**						100.0
25－29	0	4.8	15.9	**61.3**	13.3	1.3	3.5	100.0
	1	15.7	**62.7**	19.3	0.8	0.5	1.0	100.0
	2	**70.4**	27.6	1.5			0.5	100.0
	3	**70.7**	22.0	2.4			4.9	100.0
30－34	0	15.0	21.4	**43.2**	7.7	2.7	10.0	100.0
	1	24.0	**59.7**	12.2	0.6	0.3	3.3	100.0
	2	**80.8**	15.7	0.8	0.2		2.6	100.0
	3	**90.6**	5.2	0.5	0.5		3.1	100.0
35－39	0	**48.4**	23.4	19.4	1.6	0.8	6.5	100.0
	1	**70.9**	25.8	1.4			1.9	100.0
	2	**92.7**	3.4	0.4		0.1	3.4	100.0
	3	**95.5**	1.7				2.8	100.0
40－44	0	**72.4**	4.6	2.3			20.7	100.0
	1	**86.6**	7.5	1.1			4.8	100.0
	2	**96.6**	0.6	0.2			2.6	100.0
	3	**93.3**	0.7	0.2			5.8	100.0
45－49	0	**72.6**	3.2	1.1			23.2	100.0
	1	**88.0**	0.7	0.7			10.5	100.0
	2	**90.5**	0.3	0.1			9.2	100.0
	3	**90.9**	0.2				8.9	100.0

資料:表1に同じ。

表3 居住地と理想・予定子ども数

%

居住地区分		理想子ども数・予定子ども数							
		0人	1人	2人	3人	4人	5人以上	不詳	合計
非DID	理想	1.6	2.5	36.4	**46.5**	7.2	1.5	4.2	100.0
	予定	5.2	7.7	**50.1**	26.5	3.4	0.5	6.7	100.0
DID (10万人未満)	理想	2.2	3.7	**41.0**	40.7	6.7	1.3	4.4	100.0
	予定	5.8	8.9	**53.3**	22.0	2.8	0.3	7.0	100.0
DID (10－20万人未満)	理想	2.9	2.7	**44.3**	41.5	4.8	0.7	3.0	100.0
	予定	5.8	11.6	**54.5**	20.6	1.8	0.2	5.5	100.0
DID (20－50万人未満)	理想	1.8	3.4	**46.4**	38.0	5.2	0.9	4.3	100.0
	予定	4.5	8.9	**55.9**	21.2	1.9	0.5	7.1	100.0
DID (50－100万人未満)	理想	1.4	4.1	**45.9**	39.7	5.9	0.3	2.8	100.0
	予定	4.8	9.3	**59.3**	19.0	2.8	0.3	4.5	100.0
DID (100－200万人未満)	理想	4.1	3.2	**42.5**	39.1	6.3	1.4	3.4	100.0
	予定	5.9	11.3	**54.3**	18.6	1.8	0.9	7.2	100.0
DID (200万人以上)	理想	3.6	5.3	**46.6**	34.0	6.1	0.3	3.9	100.0
	予定	6.6	12.7	**54.2**	18.4	1.8	0.2	6.0	100.0
準DID	理想	2.6	3.8	**43.6**	33.3	5.1	3.8	7.7	100.0
	予定	2.6	9.0	**53.8**	17.9	1.3		15.4	100.0
合計	理想	2.3	3.3	**41.7**	41.3	6.2	1.1	4.0	100.0
	予定	5.4	9.4	**53.2**	22.4	2.5	0.4	6.6	100.0

資料：表1に同じ。

表4 妻学歴別理想・予定子ども数

%

妻学歴		夫婦にとっての理想子ども数・予定子ども数							合計
		0人	1人	2人	3人	4人	5人以上	不詳	
中学校	理想	3.2	2.4	37.9	**42.9**	6.3	1.0	6.3	100.0
	予定	9.8	8.6	**41.2**	20.6	2.9	0.7	16.1	100.0
高校	理想	2.4	3.2	40.3	**42.3**	6.4	1.2	4.2	100.0
	予定	5.4	9.1	**53.4**	22.9	2.4	0.4	6.3	100.0
専修・高専・・短大	理想	2.1	4.8	**42.8**	39.9	5.6	1.5	3.4	100.0
	予定	4.2	9.9	**55.5**	22.8	2.5	0.3	4.8	100.0
大学・・大学院	理想	1.8	3.3	**44.9**	40.1	6.2	0.9	2.8	100.0
	予定	4.7	9.9	**56.8**	21.0	3.1	0.5	4.1	100.0
その他	理想	1.6	6.6	31.1	**42.6**	9.8	1.6	6.6	100.0
	予定	6.5	15.2	**43.5**	26.1	2.2		6.5	100.0
不詳	理想	3.1	1.0	**43.8**	35.4	5.2		11.5	100.0
	予定	9.6	5.8	**40.4**	9.6		1.9	32.7	100.0
合計	理想	2.3	3.3	**41.7**	41.3	6.2	1.1	4.0	100.0
	予定	5.4	9.4	**53.2**	22.4	2.5	0.4	6.6	100.0

資料：表1に同じ。

表5a 妻から見た親との同別居別理想子ども数 %

同別居	理想子ども数							
	0人	1人	2人	3人	4人	5人以上	不詳	合計
父同居	0.4	2.3	42.5	**45.2**	6.2	1.5	1.9	100.0
母同居	0.3	3.4	40.5	**46.7**	6.2	0.9	1.9	100.0
義父同居	0.3	1.0	33.2	**54.7**	8.3	1.4	1.0	100.0
義母同居	0.3	1.2	33.9	**54.4**	7.8	1.3	1.1	100.0
父別居	0.5	2.6	40.8	**45.7**	7.7	1.2	1.5	100.0
母別居	0.6	2.6	40.6	**46.0**	7.5	1.2	1.5	100.0
義父別居	0.5	2.9	42.1	**44.7**	7.1	1.1	1.5	100.0
義母別居	0.6	3.0	41.8	**44.6**	7.4	1.1	1.6	100.0
父死亡	0.7	2.7	39.6	**47.3**	7.0	1.3	1.4	100.0
母死亡		3.1	**41.6**	41.0	9.9	1.9	2.5	100.0
義父死亡	0.8	2.7	40.8	**43.9**	8.8	1.1	2.0	100.0
義母死亡	0.9	2.3	**44.8**	37.1	10.4	1.8	2.7	100.0

資料:表1に同じ。

表5b 妻から見た親との同別居別予定子ども数 %

同別居	予定子ども数							
	0人	1人	2人	3人	4人	5人以上	不詳	合計
父同居	1.2	8.5	**58.3**	23.2	3.5	0.8	4.6	100.0
母同居	1.9	10.3	**57.6**	22.1	3.1	0.6	4.4	100.0
義父同居	2.6	5.2	**50.0**	34.9	3.5	0.3	3.4	100.0
義母同居	2.8	5.8	**51.3**	33.8	2.9	0.4	3.1	100.0
父別居	2.1	9.3	**57.4**	26.2	2.4	0.3	2.3	100.0
母別居	2.2	9.5	**57.3**	25.8	2.4	0.2	2.6	100.0
義父別居	2.1	10.0	**58.6**	24.2	2.4	0.3	2.5	100.0
義母別居	2.3	10.1	**58.4**	23.9	2.3	0.3	2.7	100.0
父死亡	3.1	11.0	**55.9**	23.0	2.5	0.2	4.3	100.0
母死亡	2.5	11.2	**51.6**	26.7	2.5	1.2	4.3	100.0
義父死亡	2.7	11.0	**58.4**	22.1	2.0	0.4	3.5	100.0
義母死亡	2.7	12.2	**57.0**	19.9	3.6	0.5	4.1	100.0

資料:表1に同じ。

表6 妻の結婚直後の従業上の地位と理想子ども数

従業上の地位		理想子ども数・予定子ども数							合計
		0人	1人	2人	3人	4人	5人以上	不詳	
正規職員	理想	2.0	2.8	41.7	**43.3**	6.0	0.8	3.5	100.0
	予定	5.0	9.0	**54.9**	23.0	2.2	0.2	5.6	100.0
パート・アルバイト	理想	3.6	3.6	**43.6**	37.9	6.4	1.1	3.8	100.0
	予定	7.4	10.4	**54.8**	18.8	1.9	0.4	6.3	100.0
自営業主・家族従業者	理想	3.2	2.6	31.4	**45.8**	9.7	1.6	5.5	100.0
	予定	7.7	7.3	**43.4**	26.0	4.3	0.8	10.5	100.0
内職	理想	3.2	2.2	**43.0**	41.9	5.4	2.2	2.2	100.0
	予定	7.5	11.8	**44.1**	23.7	4.3	2.2	6.5	100.0
無職・家事	理想	2.0	3.7	**42.7**	40.8	6.1	1.2	3.6	100.0
	予定	4.8	9.5	**53.6**	23.0	2.8	0.5	5.9	100.0
学生	理想	5.0	5.0	**45.0**	40.0	5.0			100.0
	予定	5.0	20.0	**50.0**	10.0	5.0		10.0	100.0
その他・非雇用熟練業	理想	8.6	5.7	**40.0**	**40.0**		2.9	2.9	100.0
	予定	5.7	14.3	**45.7**	20.0		2.9	11.4	100.0
不詳	理想	0.6	3.8	**40.1**	27.4	4.5	0.6	22.9	100.0
	予定	4.5	8.9	**40.8**	14.6	1.3	0.6	29.3	100.0
合計	理想	2.3	3.3	**41.7**	41.3	6.2	1.1	4.0	100.0
	予定	5.4	9.4	**53.2**	22.4	2.5	0.4	6.6	100.0

資料：表1に同じ。

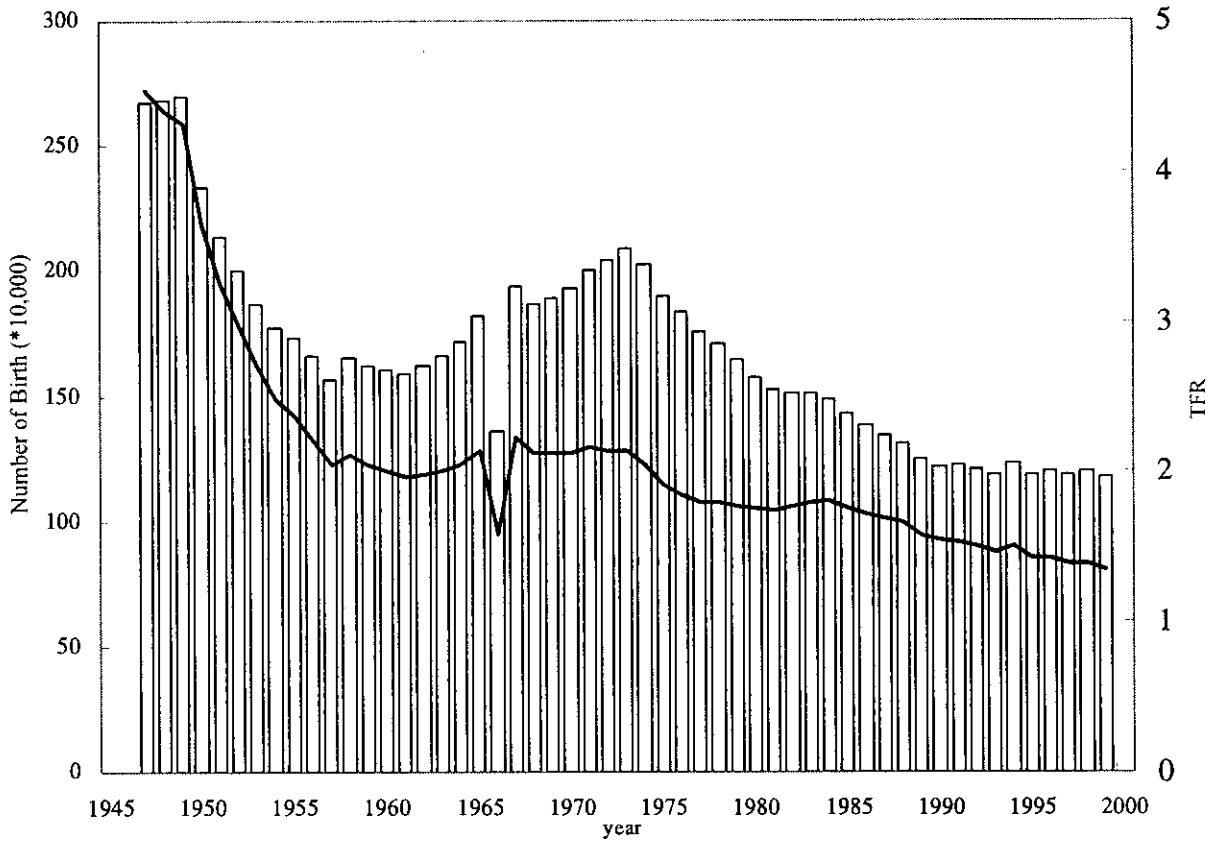
Demographic investigation of the process of declining fertility in Japan

Shigesato Takahashi

1. Overview of Japanese fertility trends in post-war period

It is possible to distinguish three stages of the post-war fertility trend in Japan. The first stage of the fertility trend appeared just after the post-war baby boom from 1947 to 1949. During the three years of the baby boom, which is uniquely short, the number of births reached about 2.7 million annually, and the total fertility rate (TFR[1]) was around 4.4. After the baby boom, the period total fertility rate marked a significant decline in both

Figure 1. Trends in Number of Birth and Total Fertilty Rate



Surce: Minstory of Health and Welfare, VITAL STATISTICS, various yeras

the number of births and total fertility rate, which was reached 2.04 in 1957 (see Figure 1). It means that the modern fertility transition from high to low was completed by the late 1950s as the first stage of the fertility trend in Japan.

After the quick transition, TFR stayed around the replacement level of fertility until the mid-1970s, while the number of births gradually increased, corresponding to an increase in population among the reproductive ages. During this second stage of the fertility trend, the only exception was appeared in 1966. In this year, the total fertility suddenly declined to 1.58, the lowest ever recorded in Japanese vital statistics history, due to the year of Hinoe-uma (fiery horse)[2]. However, in general, Japanese fertility stays at the population replacement level though the second stage of the fertility trend and it can be regarded as the period of post-demographic transition with relatively stable fertility around the replacement level.

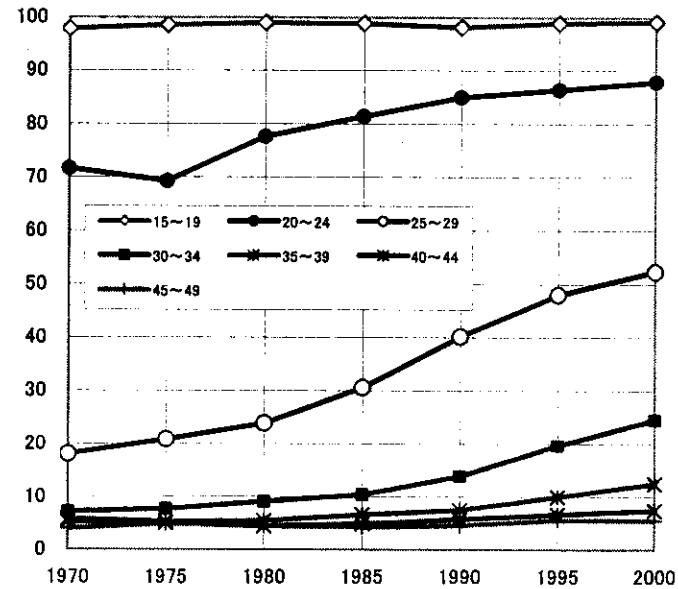
In the early 1970s, another baby boom was experienced which was an echo of the post-war baby boom. TFR recorded 2.14 in 1973. Following this second baby boom, the total fertility rate in Japan started to decline again. Although It showed a temporary increase between 1982 and 1984, it continued to decrease even steeper afterward. In 1989, it became 1.57, below the lowest recorded level in 1966. After that, it continued decreasing further until today, with some fluctuations, to 1.34 in 1999, 36 percent below the replacement level (Figure 1). This fall of fertility in recent years can be viewed as the third stage of the post-war fertility trend with below-replacement fertility.

In the next section, the demographic process in the third stage of the fertility decline in Japan will be examined in more detail.

2. Fertility Decline Since the Middle of the 1970s

The decreases in the fertility rate since mid-1970's in Japan is a direct result of a sharp decline in the marriage rates of those in childbearing ages, which is due to the younger generation's tendency to marry late in life and to remain unmarried. While 80.3 percent of females in their later 20's, were married in 1970, the proportion married have decreased to 49.6 percent in 1995, and further to 45.4 percent in 2000. The proportion of the divorced and widowed in a population

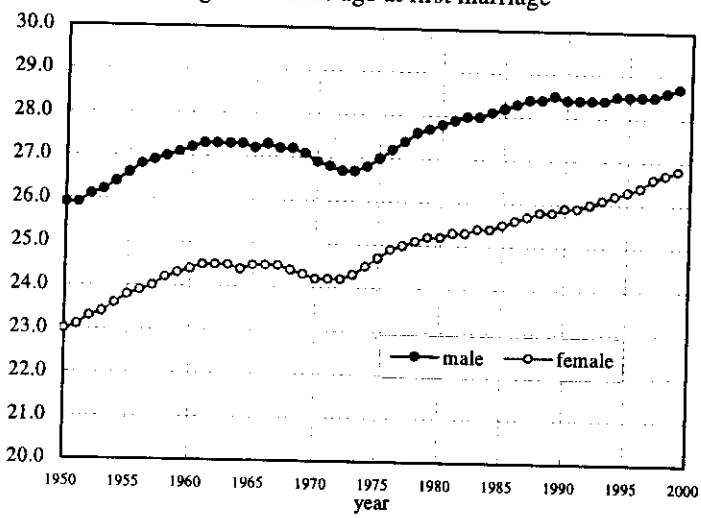
Figure 2. Proportion of Never Married, 1970-2000



Source: Bureau of Statistics, Population Census of Japan, various years

may contribute to the decrease in the proportion married in general. However, because the proportion of never married in this 35 year period soared from 18.1 percent in 1970 to 52.4 percent in 2000 (see Figure 2), we could say that a sharp increase in the proportion never married has mostly contributed to the decrease in the proportion married mentioned above. There are also changes in age at first marriage behind the increase in proportion never married (see Figure 3). In other words, since the mean age at first marriage for females increased substantially from 24.2 years of age in 1970 to 26.8 years in 1999, it is likely that the increase in proportion of never married females in their 20's can be attributed to the tendency of females marrying at a later stage in their life. In younger generations

Figure 3 Mean age at first marriage



Source: Ministry of Health and Welfare, VITAL STATISTICS, Various years

Before discussing on the demographic factors associated with the recent trend of Japanese fertility, we would like to examine characteristics of the Period Total Fertility Rate as the sum of age-specific birth rate.

According to the demographic definition, the total fertility rate (TFR) in time t can be written as follows:

$$TFR(t) = \int_{\alpha}^{\varpi} \frac{B(a,t)}{N^{F}(a,t)} da \qquad \text{.....(1)}$$

where, $B(a,t)$ is the number of births from mother aged a in time t, and $N^{F}(a,t)$ is the number of females aged a in time t. If we assume that all birth are given by only married women, equation (1) can be shown as follows:

$$TFR(t) = \int_{\alpha}^{\varpi} \left(\frac{B(a,t)}{N^{Fmar}(a,t)} \right) \left(\frac{N^{Fmar}(a,t)}{N^{F}(a,t)} \right) da \qquad \text{.....(2)}$$

where, $N^{Fmar}(a,t)$ is the number of currently married women aged a in time t.

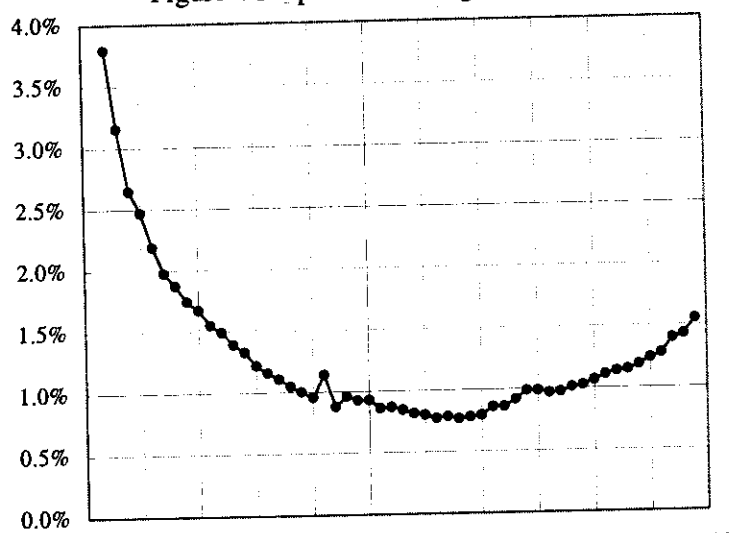
Therefore, the first factor on the right hand side of equation (2) means the marital fertility rate, $g(a,t)$, and the second factor is the proportion of married female population, $PM(a,t)$. It clearly shows that the total fertility rate is composed of two components: the proportion currently married and the marital fertility rate. The equation (2) is rewritten by using $g(a,t)$ and $PM(a,t)$ as follows:

$$TFR(t) = \int_{\alpha}^{\varpi} g(a,t)\,PM(a,t)da \quad \text{.....(3)}$$

However, equation (3) can be adopted only for the society with a very small proportion of childbirths accounting out of wedlock.

In the case of Japan, the proportion of births given outside of marriage remained small as compared with the Western developed countries. According to the vital statistics, the proportion of illegitimately births in Japan have stayed at around the 1 percent from 1960 to 1990, although it showed a clear upward trend since late 1980's. However, it attained 1.6 percent yet in 1999, far below two percent (see Figure 4). Therefore, it is possible to analyze the effectiveness of the each component to the change of total fertility rate using the equation (3).

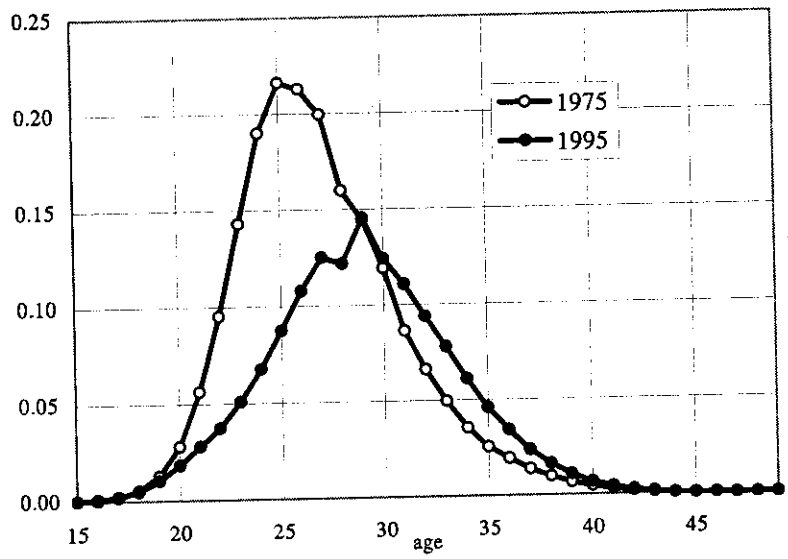
Figure 4 Proportion of Illegitimate birth



Source: Ministry of Health and Welfare, VITAL STATISTICS, Various years

Figure 5-1 shows the age-specific birth rate, $f(a,t)$, in 1975 and in 1995. These age distributions of fertility rate are the product of the marital fertility rate, $g(a,t)$, and the proportion of currently married for women, $PM(a,t)$. From 1975 to 1995, the total fertility rate declined sharply from 1.91 to 1.42. It is also seen that some drastic change appeared on the shape of age pattern of the fertility between these years. The age pattern of fertility in 1975 showed a high peak at age 25, and relatively lower course among higher ages. This picture of the change in age shape between 1975 and 1995 suggests that the delay of the age at childbirth occurred with some loss of fertility in this

Figure 5-1 Age-specific birth rate: 1975 and 1995



period.

What was happened behind of age-specific fertility rate, and it can be clarified by

Figure 5-2 Illegitimate marital fertility rates: 1975 and 1995

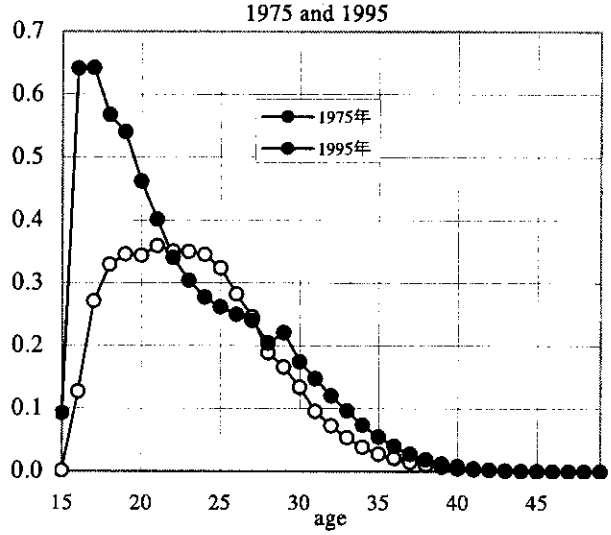
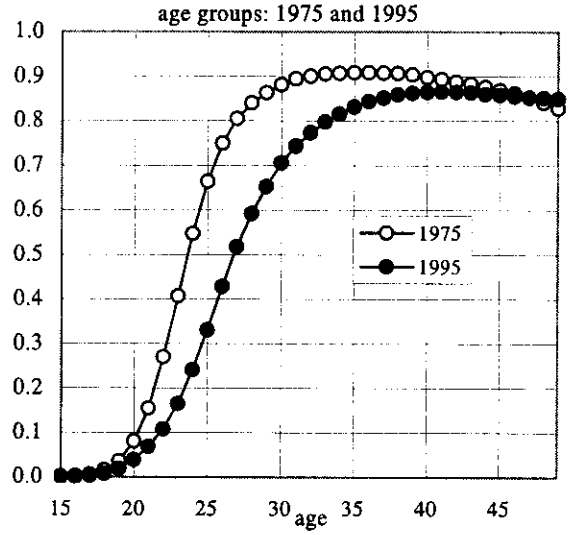


Figure 5-3 Proportion of currently married by age groups: 1975 and 1995



using the each components of equation (3) applying to these years. In figure 5-2 and figure 5-3 the age-specific marital fertility rate and the proportion of currently married women are shown for the years separately.

The age-specific marital fertility rare, $g(a,t)$, in 1975 shows the trapezoid shape with the flat roof among high reproductive ages from 18 to 25. On the other hand, if we look at the age shape of the marital fertility rate in 1995, it has drastically changed fertility among younger ages, and has slightly changed among ages from 22 to 40. Increase in such a marital fertility rate among younger ages can be explained by the change in relationships between timings of marriage and pregnancy. While the marriage of the young generation decreased, pregnancy becomes an important factor to people's decision to get married. It may explain the rise of the marital fertility rate among the younger ages in 1995. The differences in marital fertility from age 22 to 40 appeared to be due to the age shift of the childbirth timing, though the amount of the differences are relatively small.

Both patterns of the proportion of currently married for women, $PM(a,t)$, in Figure5-3 show the logistic-like curves. However, the shape of proportion married in 1995 has shifted up along with the age axis. Furthermore, the difference between 1975 and 1995 is very large at 20s and 30s. In this connection the decrease of the proportion married at 20s and 30s is considered to have strong influence on the decline of total fertility rate in this period.

We can examine the actual magnitude of the effect of decreases in proportion of currently married on the fertility rates in these periods. The decomposition method by

Cho-Retherford (1973) was applied for this analysis. In Table 1, the results of the decomposition analyses regarding the changes of TFRs between some years distant by ten years started from 1970. The changes in TFRs are decomposed into changes caused by the differences in proportion married among females and those caused by changes in marital fertility rates. Results of the decomposition classified according to age group are also presented in the table.

Table 1 Decomposition of the changes in period total fertility rates: 1970-1999

Year	1970	~	1980	~	1990	~	1999
PTFR	2.13	→	1.75	→	1.54	→	1.35
Change		-0.39		-0.20		-0.19	
	Effects from changes in proportion married						
Total(all ages)		-0.24		-0.36		-0.24	
15~19		-0.01		-0.01		0.01	
20~24		-0.14		-0.13		-0.05	
25~29		-0.09		-0.20		-0.14	
30~34		-0.01		-0.03		-0.06	
35 and over		0.00		0.00		0.00	
	Effects from changes in marital fertility						
Total(all ages)		-0.14		0.16		0.05	
15~19		0.01		0.00		-0.01	
20~24		0.01		-0.02		0.01	
25~29		-0.05		-0.01		-0.06	
30~34		-0.07		0.14		0.05	
35 and over		-0.04		0.05		0.05	

note: caluculations are based on five-year groups.

According to these results, the TFR from 1970 onward decreased in each period, and notably it is found in the decomposition that effects from the changes (decreases) in proportion of currently married were always higher than the effects from the changes in marital fertility rates. In particular, the marital fertility rates from 1980 onward moved towards increasing the TFR. In other words, a tendency toward fewer childbirths in this period resulted mainly from the increasing proportion of unmarried people especially in their 20's, but not from the declining trends in fertility rates of married couples.

According to the result, 0.24 in 0.39 which is a whole decline in total fertility rate between 1970 and 1980 was brought by the change of proportion married, and 0.14 was brought to it by the change in marital fertility. Between 1980 and 1990, the amount of 0.36 in the decline in TFR is attributed to changes in the proportion of currently married in various age groups and amount of 0.16 is contributed to the rise conversely by the changes in marital fertility. The same result was also observed about the decline of total fertility rate from 1990 to 1999.

The positive value of the latter can be interpreted that marital fertility rose over the period, contributing to a rise in TFR. In other words, the entire decline in TFR between these years can be attributed to a decline in the proportion of women of childbearing age who are currently married; and, in addition, if it were not for the increase in marital fertility, it would make the decrease in TFR even lower.

Therefore, it is clear that the immediate demographic cause for fertility decline since the mid-1970s is the dramatic drop in the proportion of women currently married of

childbearing ages. The sharp drop in the proportion currently married among younger generations was caused by the raise in the proportion of never married (see Figure 2). The proportion of never-married population for female rose from about 70 percent to 86 percent for women aged 20-24 and from about 20 percent to 52 percent for those aged 25-29 between 1975 and 1999. Such change in the marital pattern is reflected also in a gradual increase in the mean age at first marriage since the beginning of the 1970s up to now (see Figure 3). Compared with these changes in marriage behavior, there have been very few changes in fertility behavior among married couples according to various surveys on fertility. The average number of births in the group of married couples who have almost no possibility of bearing more children is called the completed fertility value. Table 2 compares changes in this value for couples whose duration of marriage is 15-19 years, and is based on the result of national Fertility Surveys conducted by the National Institute of Population and Social Security Research. It is apparent from this table that the completed fertility value, which had greatly decreased after the war, reached 2.2 persons in 1972, among the couples married for 15-19 years (couples who got married in about 1955, after the end of the baby boom). After that, it has remained fairly stable at 2.2 persons per couple. Since the current survey also shows 2.2 persons, this same value has continued since the 1970's.

Table 2 Completed fertility of couples, duration of marriage is 15-19 years

Year of survey		average number of the children ever born
1st NFS	1940	4.27
2nd NFS	1952	3.50
3rd NFS	1957	3.60
4th NFS	1962	2.83
5th NFS	1967	2.65
6th NFS	1972	2.20
7th NFS	1977	2.19
8th NFS	1982	2.23
9th NFS	1987	2.19
10th NFS	1992	2.21
11th NFS	1997	2.21

Note: These data are based on National Fertility Survey.

In sum, the recent fertility decline in Japan was mainly caused by the lengthening of single years for younger ages, which was accompanied, in turn, by the delay of marriage, the first birth, the second birth and so on. However, it must be said that this tentative conclusion is based on the analysis relying on the period fertility measure as the "hypothetical" cohort measure. It is well known in demography that postponement of marriage and birth distorts the period total fertility rate. Bongaats and Feeny (1998) clearly demonstrated such process using their formula that allows the adjustment of the period total fertility rate for this distortion. However, the method developed by Bongaats and Feeny considers only the timing of birth. Since the changes

in marriage formation strongly affected the Japanese birth rate, it should be explained by the formula including the change in prevalence of marriage and the change in the timing of marriage.

3. Cohort change in marriage formation on period fertility

Since marriage and childbirth are viewed to occur in the curse of life within a certain cohort, the trend of period fertility may be well analyzed by seeing the factor associated with the process of marriage formation along with cohort experiences. In the following, we analyze the period fertility by some scenarios assuming the various cohort changes in marriage formation. First, let's explain relationships between period and cohort fertility rates from the demographic points of view. Then we will discuss the result of calculations.

The relationships between period and cohort fertility can be shown as follows:

$$f_p(t,a) = f_c(t-a,a) \quad \text{.....(4)}$$

where, $f_p(t,a)$ is the age-specific fertility rates for women aged a at time t, and $f_c(t-a,a)$ is the age-specific fertility rates at age a for cohorts of women born at time t-a. Therefore, we get the period total fertility rate ($PTFR(t)$):

$$PTFR(t) = \int_0^w f_p(t,a)da = \int_0^w f_c(t-a,a)da. \quad \text{.....(5)}$$

We already showed that the period fertility is constructed by two components, the marital fertility rate and the proportion of currently married, according to equation (3) in previous section. Therefore, we can decompose the cohort fertility rate, $f_c(t-a,a)$, as follows:

$$f_c(t-a,a) = g_c(t-a,a)\square PM_c(t-a,a) \quad \text{.....(6)}$$

Substituting this for the function in (5), we have the period total fertility rate as the sum of product of the two cohort functions.

$$PTFR(t) = \int_0^w g_c(t-a,a)\square PM_c(t-a,a)da \quad \text{.....(7)}$$

Using equation (7), the expected period fertility rates corresponding to various assumptions on curse of cohort marriage and marital fertility experience can be examined. Comparison between the expected and the observed period fertility provides some insight into what have happened in the course of the recent fertility decline. We constructed some scenarios for changes in marriage formation.

The first scenario is that the cohort marital behavior would not have changed since cohort born in 1955. namely in this scenario birth cohorts born in 1955 and after,

have same values for the proportion of currently married for all ages.

Let $PTFR(t)^1$ represent the simulated period total fertility rates at time t. Let $g_c(t\text{-}a,a)$ denote a surface defined on the age-time place of the Lexis diagram giving the cohort age-specific marital fertility rates for women aged a at time t. Let $PM^{1955}(a)$ represent the age-specific proportion of currently married at age a for cohorts of women born in 1955. Then, expected value of period total fertility rate is

$$PTFR(t)^1 = \int_0^w g_c(t-a,a)\,PM_c^{1955}(a)da$$

Suppose that $PM^{1955}(a)$ is constant with respect to t for all a. Scenario 1 then the expected value of period total fertility rate moves only corresponding to the changes in the cohort marital fertility rates, $g_c(t\text{-}a,a)$. If we compare with the observed period fertility, $PTFR^{obs}(t)$, the difference between scenario 1 and observed can be attributed to the change in marriage.

The second scenario in this analysis is that the shape of the age pattern of cohort proportion of currently married has been moved along with the age axis according to the observed for each cohorts[3], however the level of proportion of never married at age 50 has been fixed for all cohorts at the same level as in 1955 birth cohort. In other words, in Scenario 2 the original schedule of age-specific proportion of currently married only changes the timing, but the ultimate prevalence of marriage at age 50 does not change among cohorts. The formula of the period total fertility rate for Scenario 2 is as follows:

$$PTFR(t)^2 = \int_0^w g_c(t-a,a)\,PM_c^{DM}(t-a,a)da$$

where $g_c(t\text{-}a,a)$ is the actually observed cohort marital fertility rates, and $PM_c^{DM}(t-a,a)$ is the estimated proportion of currently married based on the mathematical formula of the Boltzmann function[4]. The expected period total fertility rates based on Scenario 2 contain the effectiveness of the timing change in marriage formation along with cohorts.

In the third scenario we assumed that the shape of the age pattern of cohort proportion of married and the prevalence of marriage at age 50 have been changed according to the observed for the cohorts[5]. This scenario is the same as the previous one except that the prevalence of marriage varies over time depending on the real experiences of each cohort. Formula for this scenario is

$$PTFR(t)^3 = \int_0^w g_c(t-a,a)\,PM_c^{DPM}(t-a,a)da$$

where $g_c(t\text{-}a,a)$ is the actually observed cohort marital fertility rates as same as scenario