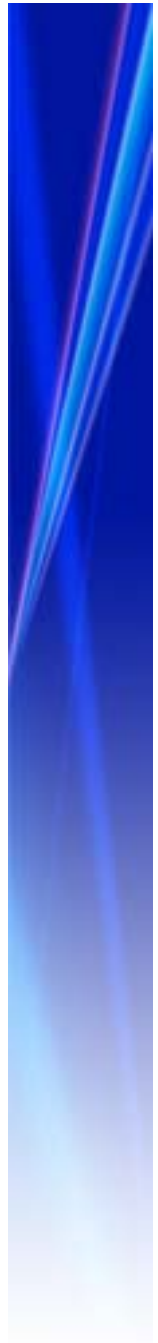# Analysis of the Effects of Macroeconomic Conditions on the First Marriage

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# Background of our Research

➢ Among Japanese demographers, there is a consensus that the decline in Japanese fertility had been caused by the decline in marriage rates among young women.

➢ They claim that the decline in marriage rates, in turn, has been caused by the increase in women with higher education and the resulting increase in women's wage rates.  But few mention the effects of macroeconomic conditions of the last two decades.

➢If women's decision to marry is affected by their work environments or wages, however, it is logical to think that they are affected by business-cycles and macroeconomic conditions, too.

# Background of our Research

➢ In contrast to the women in the US, or in other developed countries, the attitude surveys of Japanese women reveal that the majority of them are still oriented toward marriage and having children.

➢ Their labor market participation pattern suggests that they would prefer to stay as a supplementary income earner in the family.

➢ It is probably too early to claim that "social participation" of women alone account for the observed decline in Japanese fertility rate. More detailed empirical evidence needs to be accumulated on the effects of macroeconomic conditions of the last two decades on fertility or marriage behaviors.

# Purpose of the Research

➢To find out how the macroeconomic indicators such as the economic growth rate or unemployment rate affect the timing of the first marriage.

➢To use a Discrete Time Method for the Analysis of Survival Time with the time of first marriage as the endpoint.

➢To draw conclusions on the effects of macroeconomic conditions and other relevant factors on first marriage, by controlling the sex and the three **cohorts** (born in the 50's, the 60's and the 70's).

# Description of our Data

- **Name of the Data**

  − To take advantage of the rich socio-economic information of **"The Japanese Longitudinal Survey on Employment and Fertility (LOSEF): the 2011 Internet Version**" (conducted by professors Takayama, Inagaki and Oshio) including education, job history, and the adolescent family environments.

- **Age restriction of samples: Age 18 to age41**

  − Marriages under age18 are rare and subject to parental consent, making them potentially very different from the rest.

  − As we found some extreme cases among those marrying beyond age 41 in the original data, we set limit the observation to less than age 42

- **Total number of individuals 4,044**

  − Birth years: 1956 to 1981

  − Period under observation: 1968 to 2011

  − Sex compositions: Male 2,082（51.5%）Female1,962（48.5%）

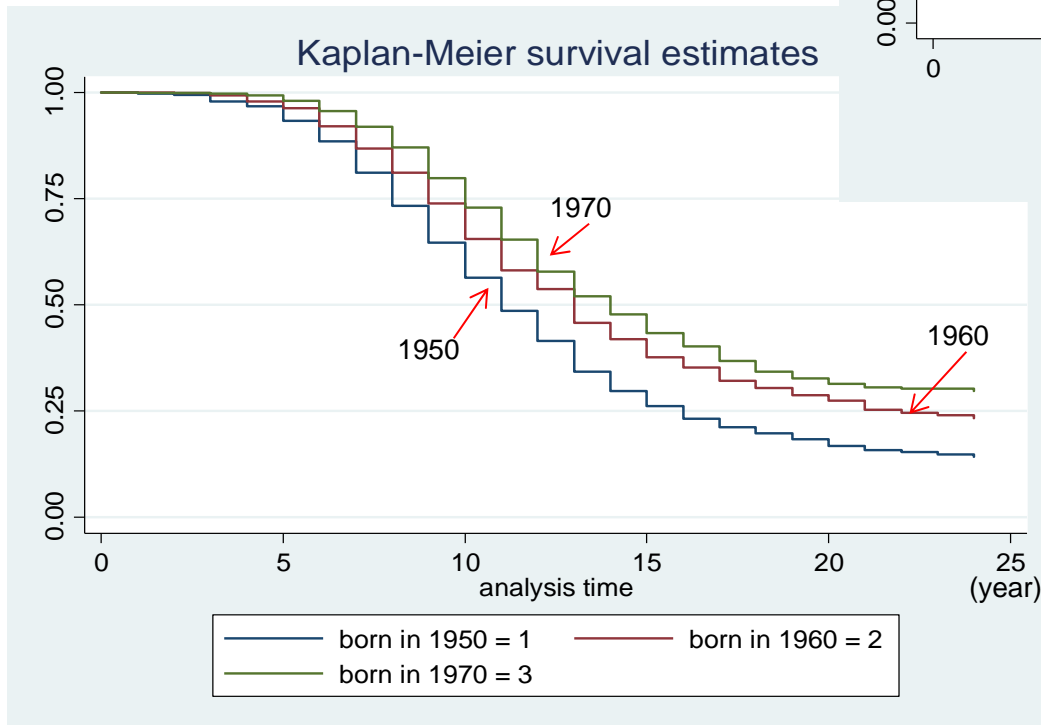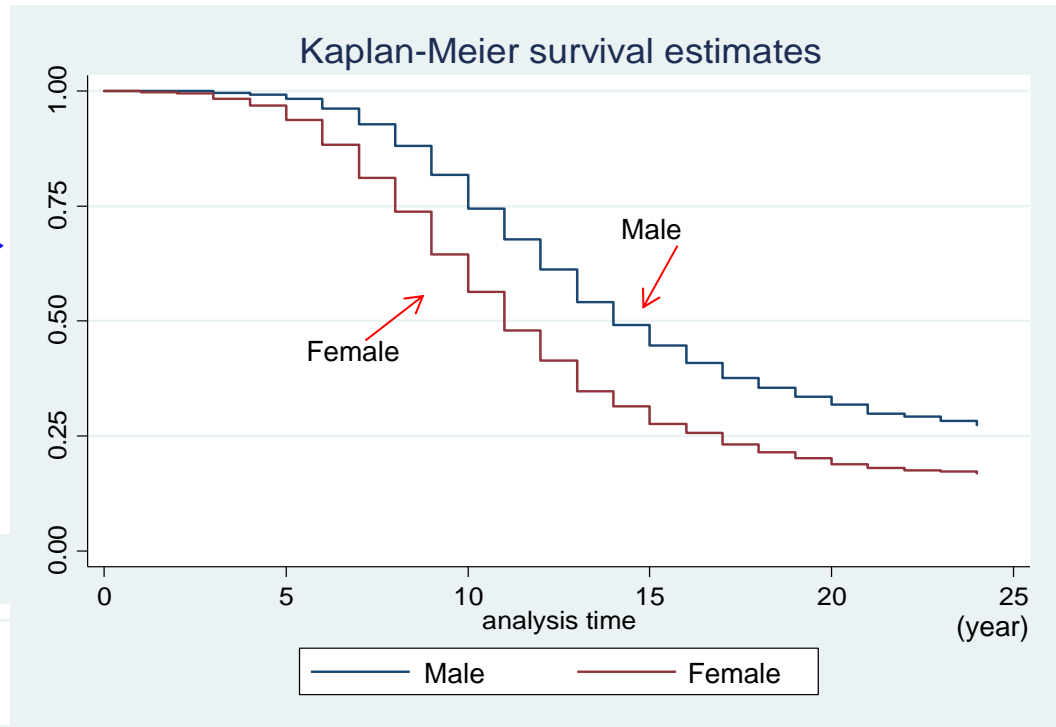  − Number of events: Male 1,478　　　　Female 1,644

# List of variables used

| Variable Name | Description | Values |
|---|---|---|
| Female | Female | Male=0  Female=1 |
| non-regular employment | non-regularly employed in the first job after school | Regularly employed in the first job=0, otherwise=1 |
| Education | The number of years in school from elementary school to the last school | Value from 12 to 18 (high schools to graduate schools) |
| Unemployment rate | Rate of unemployment of the final year in school | Percent |
| Gdp ★ | Annual rate of growth in GDP | Percent |
| Self-employed★ | Current data. Base= regular employed | Self-employed=1, 0 otherwise |
| non-regularly employed worker★ | Current data. Base= regular employed | Regularly employed=1, 0 otherwise |
| Student★ | Current data. Base= regular employed | Student=1, 0 otherwise |
| Age18-age19★<br>Age20-age21★<br>…<br>Age40-age41★ | Age 18 or age 19<br>Age 20 or age 21<br>…          Baseline= age 22 or 23<br>Age 40 to age 41 | Age 18 or 19=1, 0 otherwise<br>Age 20 or 21=1, 0 otherwise<br>…<br>Age 40 or 41=1, 0 otherwise |
| Newspaper at 15 | Family Subscription of newspaper at age 15 | Yes=1,  0 otherwise |
| Bath at 15 | Family bath at age 15 | Yes=1,  0 otherwise |
| Parents fighting  at 15 | Parents fighting at age 15 | Fighting =1, 0 otherwise |
| Family income at 15 | Level of family income at age 15 | Low=1…  High=5 |

★= time-varying variable

# Time to marriage of Kaplan-Meier estimates 1:
## Sexes and Cohorts

Men vs Women: Compared with men, the timing of first marriage is clearly earlier for women.



Kaplan-Meier survival estimates

Male

Female

analysis time (year)

Male    Female



Kaplan-Meier survival estimates

1970

1950

1960

analysis time (year)

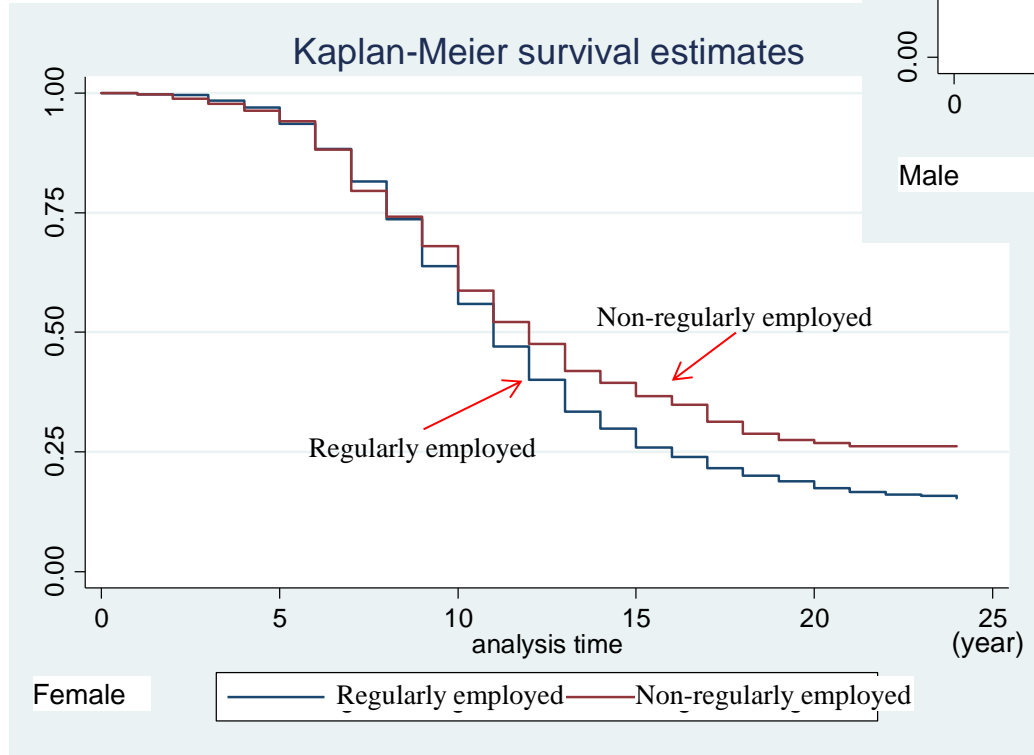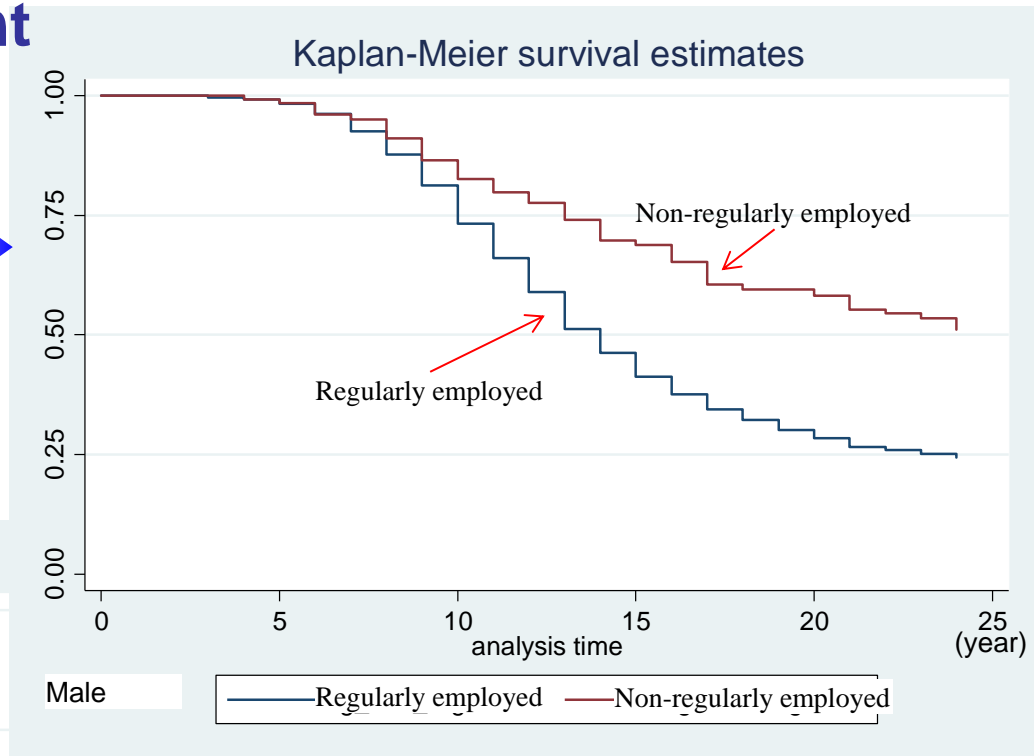born in 1950 = 1    born in 1960 = 2
born in 1970 = 3

Cohorts: The later the cohorts, the later is the timing of first marriage.

# Time to marriage of Kaplan-Meier 2:
## 1st Job Regular Employment

Male First Job: The timing of marriage is much earlier for the regularly employed men than the other men.

**Kaplan-Meier survival estimates**

Non-regularly employed

Regularly employed

analysis time (year)

Male — Regularly employed — Non-regularly employed

**Kaplan-Meier survival estimates**

Non-regularly employed

Regularly employed

analysis time (year)

Female — Regularly employed — Non-regularly employed
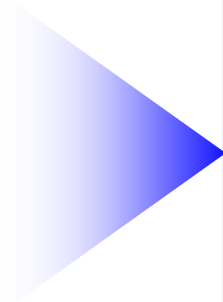
Female First Job: The timing of marriage is earlier for the regularly employed women too, but the difference is much smaller than in men.

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# Time to marriage of Kaplan-Meier 3: number of years in school

Male: More educated men catch up with less educated men by age 35 in first marriage rate.

**Kaplan-Meier survival estimates**

18 years
16 years
12 years
14 years

Male

| | 12 years | | 14 years |
| 16 years | | 18 years |

**Kaplan-Meier survival estimates**

12 years
16 years
14 years
18 years

Female

| | 12 years | | 14 years |
| 16 years | | 18 year s |
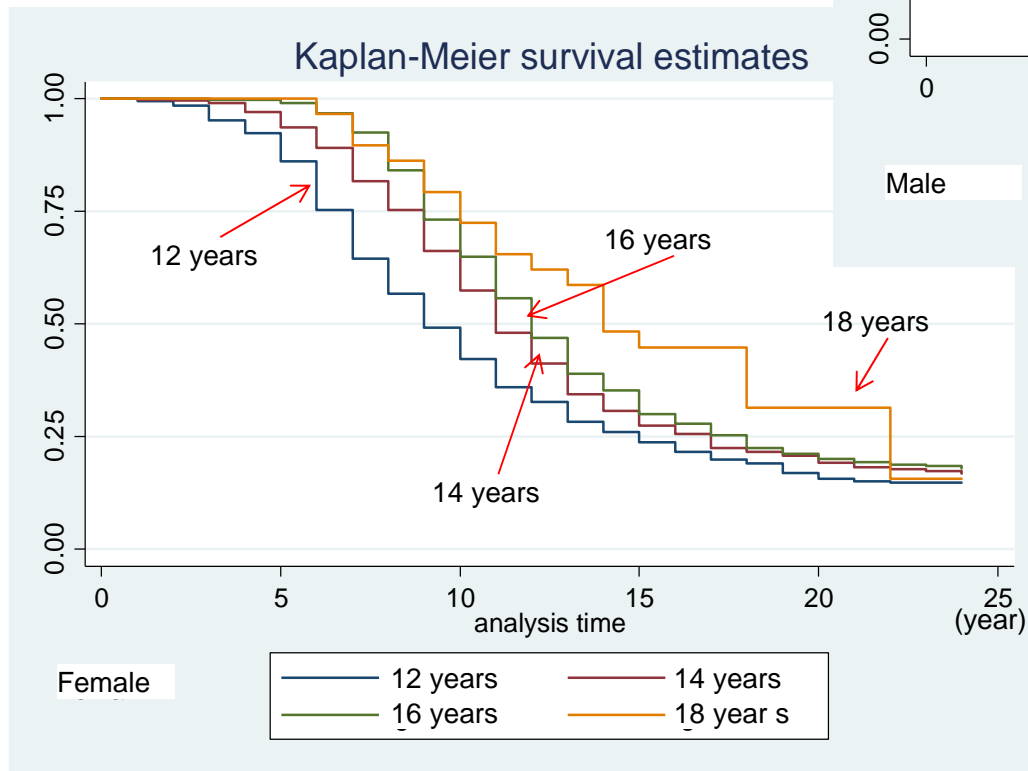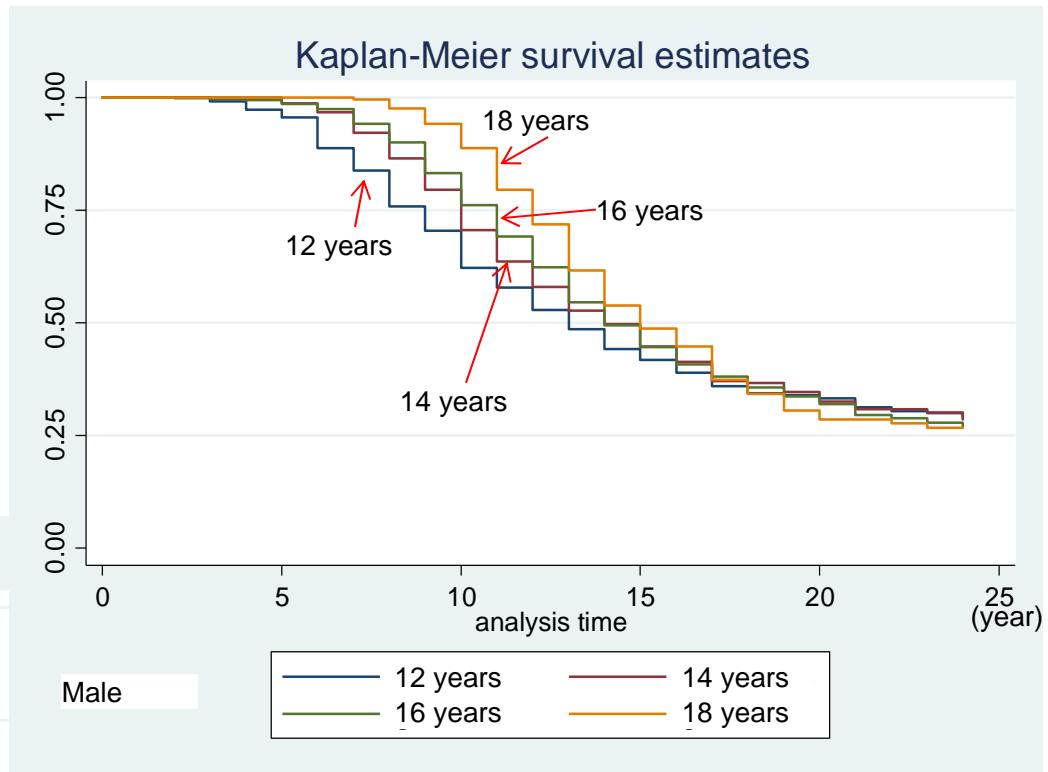
Female: more educated women generally take longer to catch up with less educated women, (compared with men).

# Time to marriage of Kaplan-Meier 4:
## Family income levels at age 15

Male: Men from the highest income family at age 15 seem to marry much earlier.



**Kaplan-Meier survival estimates** (Male)
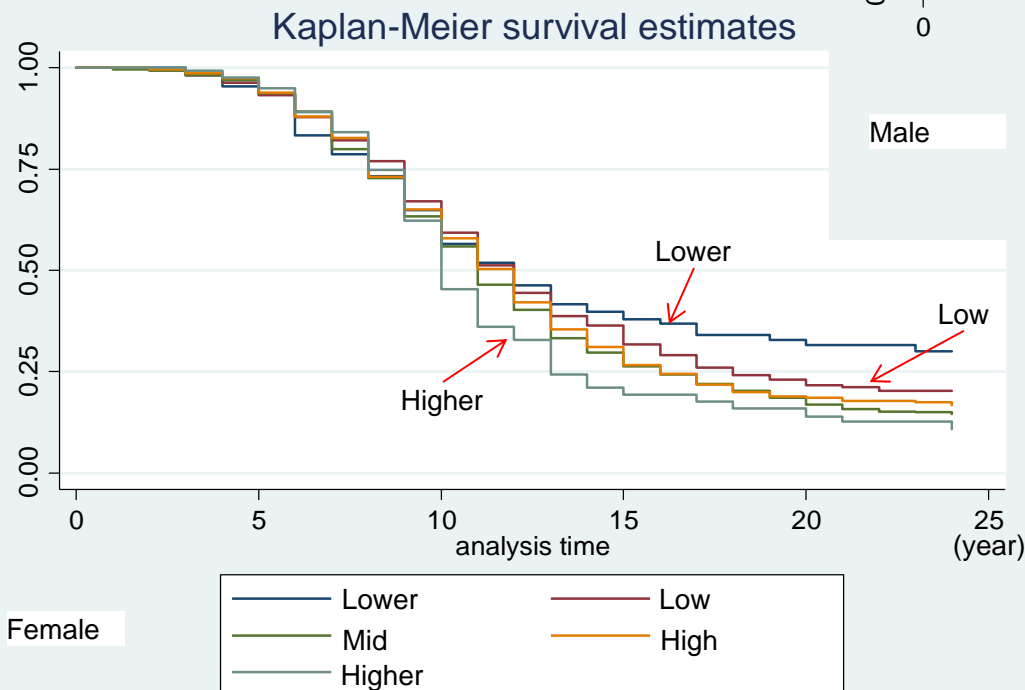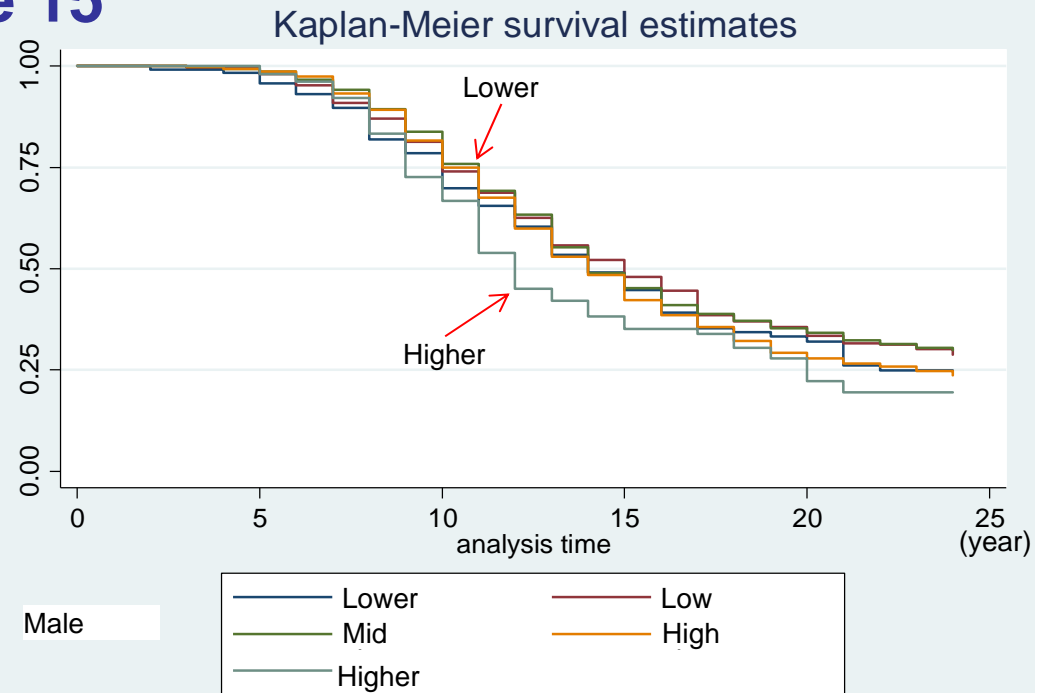
Female: Women from the higher income family seem to marry earlier.

For both men and women, the higher the family income level, the earlier is the marriage.



**Kaplan-Meier survival estimates** (Female)

# Methodology : Discrete Time Method

- We have adopted the Discrete Time Method (Allison 1982, Singer and Willett 1993), because
  - semi-parametric proportional hazard models we estimated had failed to satisfy proportionality assumptions (Schoenfeld residuals tests),
  - comparison of parametric survival models had not produced a clear-cut winner in terms of AIC etc., and
  - events in our original data were not recorded on a continuous time, but by year as a unit time.

- Discrete Time Method can
  - easily handle time varying variables, lagged variables and censoring, and
  - are usually estimated by logistic regression, or by complementary log-log function on pooled cross-section data

- We have used probit specification, as
  - stata probit command can handle instrumental variable

## Discrete Time Method (2: Skip !)

- Data Construction (Allison p.
  - Each discrete time unit for each individual is treated as a separate observation.
  - The dependent variable is coded 1 if an even occurred to that individual in that time unit; otherwise it is coded zero.
    - If an individual experienced an event at time 5, five different observations would be created. For the fifth observation the dependent variable would be coded 1. For the other four observations the dependent variable would be coded zero.
    - The explanatory variables for each of these new observations would be assigned whatever values they had at that particular unit of time. Lagged values could also be included.

# Estimation by Sex using Pooled Cohort Data
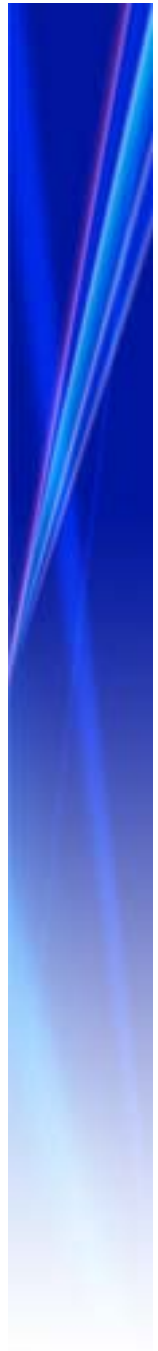
# Estimated Coefficients by Sex: All Cohorts

| | Total | | | Male | | | Female | | |
|---|---|---|---|---|---|---|---|---|---|
| | Coef. | Std. Err. | | Coef. | Std. Err. | | Coef. | Std. Err. | |
| Female | 0.2359 | 0.0204 | *** | | | | | | |
| non-regular employment | -0.1374 | 0.0307 | *** | -0.1151 | 0.0505 | ** | -0.1138 | 0.0397 | *** |
| Education | -0.0199 | 0.0062 | *** | -0.0125 | 0.0085 | | -0.0395 | 0.0095 | *** |
| Unemployment rate | -0.0571 | 0.0125 | *** | -0.0586 | 0.0184 | *** | -0.0439 | 0.0174 | *** |
| Gdp ★ | 0.0234 | 0.0046 | *** | 0.0178 | 0.0066 | *** | 0.0271 | 0.0065 | *** |
| Self-employed★ | -0.1426 | 0.0597 | ** | -0.1865 | 0.0777 | ** | -0.1000 | 0.0947 | |
| non-regularly employed worker★ | -0.0526 | 0.0267 | ** | -0.5461 | 0.0599 | *** | 0.1338 | 0.0317 | *** |
| Student★ | -0.6031 | 0.0528 | *** | -0.6512 | 0.0765 | *** | -0.5026 | 0.0763 | *** |
| Newspaper at 15 | -0.0628 | 0.0639 | | -0.0093 | 0.0835 | | -0.1399 | 0.1016 | |
| Bath at 15 | 0.0239 | 0.0416 | | 0.0162 | 0.0565 | | 0.0433 | 0.0625 | |
| Parents fighting at 15 | 0.0302 | 0.0231 | | 0.0619 | 0.0337 | * | -0.0071 | 0.0323 | |
| Family income at 15 | 0.0477 | 0.0104 | * | 0.0289 | 0.0148 | ** | 0.0672 | 0.0149 | *** |

# Age Coefficients by Sex: All Cohorts Pooled

| age | Total | | Male | | Female | |
|---|---|---|---|---|---|---|
| | Coef. | Std. Err. | Coef. | Std. Err. | Coef. | Std. Err. |
| Age18-age19★ | -0.8581 | 0.1000 *** | -1.2386 | 0.2988 *** | -0.8154 | 0.1146 *** |
| Age20-age21★ | -0.4205 | 0.0572 *** | -0.4261 | 0.1046 *** | -0.4361 | 0.0692 *** |
| Age24-age25★ | 0.2786 | 0.0389 *** | 0.2734 | 0.0655 *** | 0.2902 | 0.0491 *** |
| Age26-age27★ | 0.5325 | 0.0385 *** | 0.5638 | 0.0639 *** | 0.5120 | 0.0495 *** |
| Age28-age29★ | 0.6290 | 0.0398 *** | 0.6488 | 0.0650 *** | 0.6130 | 0.0522 *** |
| Age30-age31★ | 0.6549 | 0.0418 *** | 0.7362 | 0.0665 *** | 0.5633 | 0.0569 *** |
| Age32-age33★ | 0.5438 | 0.0458 *** | 0.6549 | 0.0705 *** | 0.4153 | 0.0649 *** |
| Age34-age35★ | 0.4591 | 0.0505 *** | 0.5648 | 0.0759 *** | 0.3442 | 0.0727 *** |
| Age36-age37★ | 0.3297 | 0.0572 *** | 0.4218 | 0.0844 *** | 0.2385 | 0.0828 *** |
| Age38-age39★ | 0.1970 | 0.0667 ** | 0.3742 | 0.0918 *** | -0.0471 | 0.1083 |
| Age40-age41★ | 0.0189 | 0.0808 | 0.2376 | 0.1065 ** | -0.3063 | 0.1411 ** |
| _cons | -1.6198 | 0.1105 *** | -1.7409 | 0.1540 *** | -1.1443 | 0.1592 *** |

Baseline= age 22 or 23

# Estimation by Cohort & Sex

# Estimated Coefficients by Cohort: Male

| | 1950's | | 1960's | | 1970's | | |
|---|---|---|---|---|---|---|---|
| | Coef. | Std. Err. | Coef. | Std. Err. | Coef. | Std. Err. | |
| non-regular employment | -0.1103 | 0.0979 | -0.0889 | 0.0998 | -0.1414 | 0.0754 | * |
| Education | -0.0098 | 0.0164 | 0.0026 | 0.0157 | -0.0404 | 0.0154 | *** |
| Unemployment rate | -0.2250 | 0.0683 *** | -0.0465 | 0.0998 | 0.0409 | 0.0291 | |
| Gdp ★ | 0.0068 | 0.0126 | 0.0200 | 0.0131 | -0.0062 | 0.0137 | |
| Self-employed★ | 0.0682 | 0.1311 | -0.0582 | 0.1433 | -0.5312 | 0.1429 | *** |
| non-regularly employed worker★ | -0.2169 | 0.1179 ** | -0.4212 | 0.1147 *** | -0.7607 | 0.0919 | *** |
| Student★ | -0.5444 | 0.1186 *** | -0.7250 | 0.1725 *** | -0.7228 | 0.1279 | *** |
| Newspaper at 15 | 0.0211 | 0.1085 | -0.3439 | 0.2201 | 0.2104 | 0.1792 | |
| Bath at 15 | 0.1373 | 0.0707 * | -0.1129 | 0.1324 | -0.2031 | 0.1458 | |
| Parents fighting at 15 | -0.0093 | 0.0582 | -0.0034 | 0.0624 | 0.1681 | 0.0576 | *** |
| Family income at 15 | 0.0519 | 0.0247 ** | 0.0028 | 0.0277 | 0.0206 | 0.0259 | |

# Age Coefficients by Cohorts: Male

| age | 1950's | | | 1960's | | | 1970's | | |
|---|---|---|---|---|---|---|---|---|---|
| | Coef. | Std. Err. | | Coef. | Std. Err. | | Coef. | Std. Err. | |
| Age18-age19★ | -1.1063 | 0.3192 | *** | 0.0000 | omitted | | 0.0000 | omitted | |
| Age20-age21★ | -0.5531 | 0.1631 | *** | -0.2698 | 0.2101 | | -0.3401 | 0.1825 | * |
| Age24-age25★ | 0.2667 | 0.0991 | *** | 0.3891 | 0.1371 | *** | 0.2234 | 0.1174 | * |
| Age26-age27★ | 0.4934 | 0.0986 | *** | 0.6907 | 0.1350 | *** | 0.5935 | 0.1123 | *** |
| Age28-age29★ | **0.6932** | 0.0993 | *** | 0.7253 | 0.1401 | *** | **0.6101** | 0.1148 | *** |
| Age30-age31★ | **0.8346** | 0.1028 | *** | **0.8682** | 0.1442 | *** | **0.6203** | 0.1177 | *** |
| Age32-age33★ | **0.6654** | 0.1120 | *** | **0.7287** | 0.1526 | *** | **0.6890** | 0.1213 | *** |
| Age34-age35★ | 0.4871 | 0.1240 | *** | **0.7658** | 0.1549 | *** | 0.5785 | 0.1323 | *** |
| Age36-age37★ | 0.4691 | 0.1307 | *** | 0.4802 | 0.1680 | *** | 0.4593 | 0.1560 | *** |
| Age38-age39★ | 0.2735 | 0.1477 | * | 0.6583 | 0.1640 | *** | 0.1422 | 0.2210 | |
| Age40-age41★ | 0.2786 | 0.1560 | * | 0.3367 | 0.1873 | ** | -0.0885 | 0.4124 | |
| _cons | -1.5606 | 0.2462 | *** | -1.5982 | 0.4256 | *** | -1.6236 | 0.2829 | *** |

Baseline = Age 22 or 23

# Estimated Coefficients by Cohort: Female

| | 1950's | | 1960's | | 1970's | | |
|---|---|---|---|---|---|---|---|
| | Coef. | Std. Err. | Coef. | Std. Err. | Coef. | Std. Err. | |
| non-regular employment | -0.0554 | 0.0842 | 0.0467 | 0.0795 | -0.2119 | 0.0569 | *** |
| Education | -0.0694 | 0.0199 *** | -0.0405 | 0.0177 ** | -0.0572 | 0.0157 | *** |
| Unemployment rate | -0.1112 | 0.0754 | -0.0263 | 0.1047 | 0.0669 | 0.0251 | *** |
| Gdp ★ | -0.0086 | 0.0147 | 0.0216 | 0.0128 * | 0.0002 | 0.0125 | |
| Self-employed★ | 0.0110 | 0.1578 | -0.2004 | 0.1823 | -0.1071 | 0.1652 | |
| non-regularly employed worker★ | 0.4293 | 0.0634 *** | 0.0759 | 0.0588 | 0.0309 | 0.0488 | |
| Student★ | -0.2998 | 0.1210 *** | -0.6152 | 0.1523 *** | -0.5399 | 0.1423 | *** |
| Newspaper at 15 | -0.2677 | 0.1643 * | 0.0641 | 0.2237 | -0.0618 | 0.1762 | |
| Bath at 15 | 0.1450 | 0.0899 | 0.0151 | 0.1079 | 0.0815 | 0.1664 | |
| Parents fighting at 15 | -0.0794 | 0.0670 | -0.0521 | 0.0574 | 0.0242 | 0.0503 | |
| Family income at 15 | 0.0231 | 0.0284 | 0.0917 | 0.0293 *** | 0.0706 | 0.0229 | *** |

# Age Coefficients by Cohorts: Female

| Age class | 1950's | | 1960's | | 1970's | |
|---|---|---|---|---|---|---|
| | Coef. | Std. Err. | Coef. | Std. Err. | Coef. | Std. Err. |
| Age18-age19★ | -0.9182 | 0.1701 *** | -0.9442 | 0.2532 *** | -0.6582 | 0.2141 *** |
| Age20-age21★ | -0.4134 | 0.1061 *** | -0.3772 | 0.1206 *** | -0.7443 | 0.1799 *** |
| Age24-age25★ | 0.3276 | 0.0840 *** | 0.2367 | 0.0910 *** | 0.3272 | 0.0856 *** |
| Age26-age27★ | **0.4686** | 0.0893 *** | **0.5072** | 0.0934 *** | 0.6036 | 0.0838 *** |
| Age28-age29★ | **0.4450** | 0.1001 *** | 0.4586 | 0.1045 *** | **0.8518** | 0.0843 *** |
| Age30-age31★ | 0.3253 | 0.1148 *** | **0.6063** | 0.1111 *** | **0.7414** | 0.0914 *** |
| Age32-age33★ | 0.2073 | 0.1304 | 0.3841 | 0.1269 *** | 0.6490 | 0.1018 *** |
| Age34-age35★ | -0.0921 | 0.1601 | 0.2245 | 0.1389 | 0.7416 | 0.1102 *** |
| Age36-age37★ | 0.1053 | 0.1536 | 0.2537 | 0.1423 * | 0.4077 | 0.1454 *** |
| Age38-age39★ | -0.2530 | 0.1991 | -0.0080 | 0.1650 | 0.0479 | 0.2337 |
| Age40-age41★ | -0.6275 | 0.2629 ** | -0.1704 | 0.1883 | omitted | |
| _cons | **-0.1539** | 0.2823 | **-1.3747** | 0.4476 *** | **-1.4836** | 0.2789 *** |

Base line = Age 22 or 23

## Our Findings (1) : Macroeconomic Conditions

- The estimation of pooled cohort data shows that macroeconomic conditions influence the timing of first marriage;

  - a **higher rate of economic growth shortens** the time to first marriage for both men and women;
  - a **higher rate of unemployment in the graduating year delays** first marriages for both men and women;

- In the estimation by cohort, however, most of these results disappear, probably because of the limited variations in these indexes within each cohort:

  - **the exception is the 1970's cohort women; a higher unemployment rate** in the graduating year seems to be **shortening the time to first marriage, which can be a risk-pooling behavior.**

## Our Findings (2)

- Estimation by cohort confirms that employment types of men is important for men's marriage, but not necessarily so for women;

  - **irregular employment for men is associated with substantially lower probabilities of marriage** than regular employment, but not for women;

  - being a student is associated with substantially lower probability of marriage for both men and women of the 60's and 70's cohorts;

  - in the 70's cohort, an irregularly employed man is almost equal to a male student in terms of the probability to marry.

· We also found that, controlling for being a student, more education for women means later marriage, but not necessarily so for men.

·

## Our Findings (3)

• Contrary to previous works, we have found **men and women from higher income families** tend to **marry earlier.**

•Over the last three cohorts, the first marriage has been progressively delayed;

## Conclusion

• We had expected to find the macroeconomic conditions affect the timing of first marriage by changing the economic environments of raising children. We have found some evidence of the effects in our estimation of pooled cohorts data.

• Most of the effects disappeared in the estimation by cohorts. There are two possibilities; one is that young women react to large macroeconomic changes but not minor ones. Another possibility is that they react to large negative changes.

• The women born since 1970 went into the labor market in the severe recession, just after the bubble economy had bursted. They had shown a higher probability to marry. This can be regarded as a risk-pooling behavior.

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