The 5th East Asian Social Policy (EASP) International Conference

An Empirical Analysis of Marriage Duration among the Middle Aged and Elderly in Taiwan

Wen-Shai Hung[1]
Department of Business Administration, Providence University
200 Chung-Chi Rd., Shalu, Taichung 43301, Taiwan
Phone: 04-26328001 ext. 13305
E-mail: wshung@pu.edu.tw

[1] The author is a PhD Candidate at the Department of Economics and Finance in the University of Durham in the United Kingdom. The author would like to thank Professor Tim Barmby and Dr. Martin Robson for their helpful suggestions. Thanks also to the Population and Health Research Centre, Bureau of Health Promotion for providing the Survey of Health and Living Status of the Middle Aged and Elderly in Taiwan data.

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Abstract

This paper investigates the factors influencing marriage duration among the middle aged and elderly in Taiwan. The micro data used is from the Survey of Health and Living Status of the Middle Aged and Elderly in Taiwan (SHLS), which contains detailed information on individuals, family structure, health, social support, employment, and economic status. Weibull models are used to estimate the hazard rates of marriage duration, including divorce (included separation) and death of spouse. Further, this paper examines the effect of unobserved heterogeneity on estimated individual hazard rates of marriage duration. First, for the cases of divorce and death of spouse, the empirical results show that people with poor health, and whose partner has a higher level of education have a higher hazard rate of divorce and widowhood. In contrast, people with higher income, and elderly people with more children have a lower hazard rate of divorce and widowhood. The empirical results also confirm that, after considering unobserved heterogeneity, most estimated coefficients on the marriage hazard regressors are larger in magnitude that the corresponding coefficients in the reference model. Second, for the case of divorce only, the results include findings that: people aged 60 to 64, Aboriginals, people with better education, people with poor health, and whose partner has a higher level of education have a higher hazard rate of divorce. In contrast, Buddhists, people with higher income, and elderly people with more children have a lower hazard rate of divorce. However, the effects of unobserved heterogeneity become less serious and indifferent in this case.

Key words: duration analysis, micro data, unobserved heterogeneity, and marriage.
JEL Classification: C41, C81, J12.

1. Introduction

This paper investigates the influencing factors of marriage duration among the middle aged and elderly in Taiwan. Most previous studies on marriage behaviour in Taiwan have focused on psychology and revealed topics, including premarital relationships, marital satisfaction, marital conflict, marital adjustment, intimacy, and violence in marriage. For example, looking at premarital relationships, Tsai (1994) explored the trends and patterns of assortative mating in post-war Taiwan, with particular attention paid to the tendency toward status homogamy. Chang (1999) used a systems framework for a marital adjustment study. Chang (2006) reviewed family and marriage research in Taiwan, particularly the use of psychological methods over the past 20 years. Chang and Chan (2007) examined factors affecting mate selection among Taiwanese couples. However, few papers have used the duration model (see, Ku, 2003) or considered economic status in analysis of individual marriage behaviour, specifically for the hazard events of divorce (included separation) and death of spouse (widowed).

In addition, it is well known that duration analysis produces incorrect results if unobserved heterogeneity is ignored (Lancaster, 1990). Therefore, this paper uses a duration model and considers the effect of unobserved heterogeneity[2] on estimated individual marriage behaviour.

The remainder of the paper is structured as follows. Section 2 presents background material on marital status among the middle aged and elderly in Taiwan. Section 3 describes the estimation methods, including the effect of without and with unobserved heterogeneity on estimated individual marriage behaviour. Section 4 presents data description, including data source and variables specification. This is followed by the major empirical results in Section 5, particularly for examining the effects of unobserved heterogeneity on estimated marriage duration. Section 6 concludes the paper.

2. Some Basic Facts about Marital Status of the Middle Aged and Elderly in Taiwan

The Taiwangovernment report (MOI, 2005), summarises some basic facts about marital status of people aged 50 and older in 2005. For example, Table 1 shows that the proportion of married males is higher than married females'. This means that females are more likely to lose their partner, particularly through widowhood. This

[2] See Hosmer and Lemeshow (1999) and Cleves, Gould, and Gutierrez (2004) for a description of the frailty models.

trend is consistent with the longer life expectancy of women in Taiwan. For the different age groups, the relatively younger group have higher proportions of married and divorced cases than other groups. There is a significant increase in the proportion rates of widowhood from 5.67% by ages 50-54 to 40.78% by ages 65 and older.

Further, for the education attainment factor, a higher proportion of people with better education are married. In contrast, people with poor education have a higher proportion rate of widowhood, and people with senior high school education have a higher proportion rate of divorce or separation. For self-reported health, married people always have a higher proportion rate of better health than other groups, next is divorced persons, and the last is widowed.

Moreover, for economic status, married people have a higher proportion rate of earnings than other groups, particularly for ‘spouse providing’. The widowed have a higher proportion rate of income from their children and other relatives than other groups, there might be some relationships with traditional Chinese culture and the high value placed on the family.

For the residence and family support factor, a higher proportion of married people live with their spouse and children than other groups. The widowed have a higher proportion rate of living with their children than other groups, this also supports the social valuation of the family within traditional Chinese culture. Finally, for participation in religious activity, married people have a slightly larger proportion of religious participation rate than those in other groups.

3. Estimation Method: Weibull Model

Duration analysis has been developed in the field of bio-statistics to describe the timing of events. It has become a subject of increasing interest to applied economics. For example, Diamond and Hausman (1984) were the first to employ the regression-type hazard model to examine the determinants of individual retirement and savings. Their specification of the model solved three problems: censoring, dynamic regressor variables, and dynamic self-selection. For instance, to resolve the sample-censoring problem, hazard models are used instead of the more traditional regression-type models. They divided their sample into three groups, including left censoring (individuals who retired before the beginning of the sample period), right censoring (individuals who do not retire during the sample period), and event or failure time (individuals who retire during the sample period). Therefore, this study follows this estimated method and considers marital status in two groups, including

right censoring (individuals who remain married during the sample period), and event or failure time (individuals do not remain married, including divorce and death of spouse during the sample period). From these two sets of individuals, I calculated the likelihood of marriage duration.

3.1 The Model without Unobserved Heterogeneity

Weibull distributions are widely used as models for duration analysis. The hazard function of marriage duration without unobserved heterogeneity is specified as

$$h(t \mid x_i) = \alpha t^{\alpha-1} \cdot \lambda = \alpha t^{\alpha-1} \cdot e^{(\beta_0+\beta_i x_i)}. \quad (1)$$

Empirically, the parameters λ and α in the Weibull distribution can be estimated by maximum likelihood. The parameter λ depends on the explanatory variables x_i, thus providing us with a more flexible hazard function. For example, the hazard function is increasing if $\alpha > 1$, decreasing if $\alpha < 1$, and constant if $\alpha = 1$. For observed duration data, $t_1, t_2, ..., t_n$ the log-likelihood function can be formulated and maximized to include censored and uncensored observations. Combining these duration models into a general parametric likelihood yields:

$$L(\beta) = \prod_{i=1}^{n} \left\{ \left[f(t_i \mid x_i, \beta) \right]^{c_i} * \left[S(t_i \mid x_i, \beta) \right]^{1-c_i} \right\}. \quad (2)$$

where $\beta = (\lambda, \alpha)$, and $c_i = 1$ represents uncensored observations, $c_i = 0$ represents right-censored observations (Cleves, et al, 2002). To obtain the maximum likelihood with respect to the parameters of interest, β, then maximise the log-likelihood function:[3]

$$\ln L(\beta) = \sum_{i=1}^{n} \left\{ c_i \ln \left[f(t_i \mid x_i, \beta) \right] + (1 - c_i) \ln \left[S(t_i \mid x_i, \beta) \right] \right\}. \quad (3)$$

The procedure to obtain the values of maximum likelihood estimation requires taking derivatives of $\ln L(\beta)$ with respect to β, the unknown parameters, setting these equations equal to zero, and solving for β.[4]

3.2 The Model with Unobserved Heterogeneity

After considering unobserved heterogeneity on estimated individual marriage behaviour, the hazard function can be defined as

$$h(t \mid x_i, u) = \alpha t^{\alpha-1} \lambda = \alpha t^{\alpha-1} \cdot e^{(\beta_0+\beta_i x_i+u)}. \quad (4)$$

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[3] Since the log function is monotone, maxima of (2) and (3) occur at the same value of β; however, maximizing (3) is computationally simpler than maximizing (2).

[4] See Klein and Moeschberger (1997), for a description of the numerical methods for implementing multivariate Newton-Raphson methods.

where u can represent unobserved heterogeneity, the differences between observations are introduced via a multiplicative scaling factor. This is a random variable taking on positive values, with the mean normalised to one and finite variance σ^2. A crucial assumption in the model is that u is distributed independently of x_i and t. The other calculation procedures are same with the previous model without unobserved heterogeneity.

4. Data Description

4.1 Data Source

The data used is from the Survey of Health and Living Status of the Middle Aged and Elderly in Taiwan (SHLS), a joint survey conducted by the Taiwan Provincial Institute of Family Planning[5] and the Population Studies Centre, University of Michigan. The total sample was 2462 observations aged 50 to 70, and their spouses, in 1996. The second wave of SHLS had 2130 respondents in 1999, and the third wave had 2035 respondents in 2003. The survey questionnaires contain eight distinct sections: (i) Background information, marital status, and living situation; (ii) Family structure, general circumstances, and living with kin; (iii) Health, use of medical services, and hygiene habits; (iv) Social support and exchange of support; (v) Employment history; (vi) Leisure, activities, and general attitudes; (vii) Economic status; (viii) Livelihood plans. The SHLS survey data are fairly comprehensive and thus allow for a detailed discussion of the marriage behaviours of the middle-aged and elderly in Taiwan.

4.2 Variables Specification

4.2.1 Dependent Variable

According to the SHLS data, the sample consists of two groups, namely the current married and unmarried, except single people. The former group remain married during the sample period and are known as “right-censored” of marriage duration. The latter group do not remain married, including divorced (separated) and widowed during the sample period, and the date on which an individual started their last marriage and the exact age at which they lose their marriage were observed. These are known as the “uncensored” of marriage duration. Therefore, the times of marriage duration include the period from when an individual first married to the end of the marriage for the “uncensored” duration spells, and they continue married for the “right-censored” duration spells. This variable can be categorized as a dependent variable. The uncensored variable is coded 1 for ending their marriage and 0

[5] The Taiwan Provincial Institute of Family Planning was merged into the Bureau of Health Promotion, Department of Health in July 2001.

otherwise.

4.2.2 Explanatory Variables

The explanatory variables recorded in the SHLS data include (1) Demographic characteristics of respondent: age, gender, race, religion, educational attainment, and health status. (2) Demographic characteristics of respondent's partner. (3) Economic factors: household income and eligibility for a pension. (4) Family structure and support: number of children and residence status. The details of these variables are described below.

First, the demographic characteristics of respondents are explored. The effect of ageing alone is important in explaining why people losing their married status. In particular, as people become older, they are more likely to die or lose their partner. From the 1996 SHLS data, age can be categorised into four groups: Age1 (aged 50 to 54), Age2 (aged 55 to 59), Age3 (aged 60 to 64), and Age4 (aged 65 to 70). In addition, females always have a longer life expectancy than males in Taiwan. That is, the number of females who lose their husbands are is greater than males who lose their wives. The Gender variable is coded 1 for female and 0 for male. Next, the Race variables have four groups, namely Race1 (Fujianese), Race2 (Hakka), Race3 (Mainlander), and Race4 (Aboriginal). For the Religion variables, there are four groups, namely Reli1 (None), Reli2 (Daoism), Reli3 (Buddhism), and Reli4 (Others: for example, Christian). The education variable is divided into four levels of schooling, namely Edu1 (informal schooling), Edu2 (primary level: 1 to 6 years), Edu3 (high school level: 7 to 12 years) and Edu4 (college level: 13 to 17 years). For the health assessment, the SHLS survey identifies five levels including excellent, good, average, not so good, and poor. The Health variable is coded 1 for poor health, including "not so good" and "poor" health, and 0 for otherwise.

Second, the demographic characteristics of respondents' partners are also examined, particularly for their partner's age, race, educational attainment, and partner health. Basically, if their partner is age, with a better education, or with poor health they might have a higher hazard rate of losing their marriage.

Third, the economic status variables cover eligibility for a pension and household income. If people have a better economic status or higher income, they might have a lower hazard rate of ceasing to be married. Fourth, for family structure and support, the number of children can reflect marriage duration and living support. In particular, the traditional Chinese culture in Taiwan suggests that people with more children

expect more family support in old age. The descriptive and summary statistics of the sample are considered for two cases of marriage ending and are given in Tables 2 and 3.

5. Empirical Results

5.1 The Cases of Divorce and Death of Spouse

Frailty is a random component designed to account for variability due to unobserved individual-level factors that are otherwise unaccounted for by the other predictors in the marriage duration model. In particular, suppose the SHLS data belong to a random sample, the shared frailty models can be used for estimating the effects of unobserved heterogeneity on marriage behaviour.

The empirical results of divorce and spouse decease cases are shown in Table 4. First, before considering unobserved heterogeneity, the estimated coefficients of those with Health and Peduction variables are positive and statistically significant and have higher hazard rates of divorce and widowhood *ceteris paribus*. That is, people with poor health, or whose partners have better education are more likely to have a higher probability of divorce or death of spouse. In contrast, the estimated coefficients for Income, and Children variables are significantly negative. This means that people with higher income or people with more children might have a stronger economic and family support and have a lower probability of divorce or spouse decease. The estimate for the shape parameter is 2.218 suggesting an increasing hazard over time.

Second, after considering unobserved heterogeneity, the frailty model is assumed to follow a gamma distribution with mean 1 and variance equal to theta (θ). The estimate of theta is 0.226. A variance of zero (theta = 0) would indicate that the frailty component does not contribute to the model. A likelihood ratio test for the hypothesis theta = 0 is shown directly below the parameter estimates and indicates a chi-square value of 16.27 with 1 degree of freedom yielding a highly significant p-value of 0.000. Notice how all the parameter estimates are altered with the inclusion of frailty. The estimate for the shape parameter is now 2.219, different from the estimate 2.218 obtained from the model without frailty. The inclusion of frailty not only has an impact on the parameter estimates but also complicates their interpretation. The other estimated coefficients on the regressors Health, Pension, and Income are a little bit larger in magnitude than the corresponding coefficients in the reference model. The Weibull distribution shape parameter α is also a little bit larger in the frailty model than in the reference model.

5.2 The Case of Divorce Only

The empirical results of divorce case only are shown in Table 5. First, before considering unobserved heterogeneity, the estimated coefficients of those with Age3 (ages 60-64), Race4 (Aboriginal), Edu2, Edu3, Health, and Peducation variables are positive and statistically significant and have higher hazard rates of divorce *ceteris paribus*. This means that people aged 60-64, Aboriginals, people with better education, people with poor health, and whose partners have better education have a higher hazard rate of divorce.

In contrast, the estimated coefficients for Relig3 (Buddhist), Page2 (ages 50-54), Page4 (ages 60-64), Income and Children variables are significantly negative and have lower hazard rates of divorce *ceteris paribus*. This means that Buddhists prefer to have a lower hazard rate of divorce. Further, older partners also have a lower hazard rate of divorce, this may be because of the influence of traditional social values. Moreover, people with higher income and more children also have a lower hazard rate of divorce. The estimate for the shape parameter is 1.202 suggesting an increasing hazard over time.

Second, after considering unobserved heterogeneity, the frailty model is assumed to follow a gamma distribution with mean 1 and variance equal to theta (θ) . However, the estimated results are same as without unobserved heterogeneity. Therefore, most people do not like to make this decision. If people make this decision, they must consider all the implications of divorce.

6. Conclusion

This paper has used the SHLS to study the factors influencing marriage duration among the middle aged and elderly in Taiwan, particularly examining two cases of loss of married status. First, for the cases of divorce and spouse decease, the key findings are that people with poor health, and partners with better education have a higher hazard rate of divorce and widowhood. In contrast, people with higher incomes, and elderly people with more children have a lower hazard rate of divorce and widowhood. The empirical results also confirm that, after considering unobserved heterogeneity, most estimated coefficients on the marriage hazard regressors are larger in magnitude than the corresponding coefficients in the reference model.

Second, for the case of divorce only, the empirical results show that people aged 60 to 64, Aboriginals, people with better education, people with poor health, and partners with better education have a higher hazard rate of divorce. In contrast,

Buddhists, people with higher income, and the elderly with more children have a lower hazard rate of divorce. However, the effects of unobserved heterogeneity become less serious and indifferent in this case.

The current study has generated important insights into the factors that influence marriage behaviour among the middle aged and elderly in Taiwan. However, a limitation of the SHLS survey data is that it does not contain information on the people aged below 50. In future work, it would be useful to include information on ages below 50 in order to further deepen our understanding of the factors that influence marriage behaviour in Taiwan.

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Table 1 Some Basic Facts about Marital Status of Aged 50 and older in Taiwan, 2005

Unit: %

Terms	Married	Widowed	Divorced or Separated	Never Married
Gender				
Male	89.11	2.61	6.10	2.17
Female	76.72	15.41	5.79	2.09
Age Groups				
50~54	85.35	5.67	6.28	2.70
55~59	82.88	9.01	6.11	2.00
60~64	77.88	15.90	5.07	1.14
65+	55.26	40.78	2.35	1.61
Education				
Informal	67.37	25.89	3.82	2.92
Primary School	80.46	12.75	5.50	1.29
Junior School	85.31	7.16	6.39	1.14
Senior School	86.16	3.75	7.77	2.32
College	86.83	4.81	4.06	4.29
University and over	89.13	1.32	6.04	3.51
Health Status				
Excellent	20.41	11.64	19.06	21.76
Good	34.35	20.84	30.75	21.38
Average	31.03	39.89	27.62	35.90
Not so good	11.60	22.79	16.80	12.37
Poor	2.39	3.49	5.17	8.59
No answer	0.22	1.35	0.60	0
Main Income Resource				
Earnings from work	51.64	33.73	50.29	42.98
Spouse’s providing	24.91	0.00	0.00	0.00
Income from rental property, savings, or yield from stock	10.85	9.64	13.48	29.89
Pension, retirement fund, insurance benefits	7.02	5.13	6.42	9.61
Children or other relatives	19.95	54.31	28.65	1.35
Borrow money	0.58	0.30	0.52	0.00
From government support	1.55	3.82	5.02	15.56
From social assistance	0.27	2.70	5.33	5.73
Others	0.38	0.99	0.51	4.02

Living with				
Spouse and children	41.07	60.32	30.69	3.25
Only with spouse	35.50	0.00	4.36	0.00
Single	2.70	16.44	31.63	49.35
Others	2.09	4.22	10.08	25.33
No answer	18.63	19.02	23.23	22.08
Participate in Religious Activity				
Always	9.83	11.06	11.37	7.40
Sometime	29.37	27.28	26.34	23.65
Never	60.81	61.67	62.29	68.95

Source: Author tabulations from the *Summary Analysis for the Elderly Survey in the Taiwan and Fujian Areas in 2005*, Department of Statistics, Ministry of the Interior, Taiwan (in Chinese).

Table 2 Descriptive Statistics of Variables for the Cases of Divorce and Death of Spouse

Variables	Description	Mean	Std Err
DURATION	1-51 years.	31.691	(8.115)
CENSOR	1 = Uncensored, 0 = Otherwise.	.125	(.331)
AGE1	1= Aged 50 to 54, 0 = Otherwise.	.302	(.459)
AGE2	1 = Aged 55 to 59, 0 = Otherwise.	.322	(.467)
AGE3	1 = Aged 60 to 64, 0 = Otherwise.	.262	(.439)
AGE4	1 = Aged 65 to 70, 0 = Otherwise.	.113	(.317)
GENDER	1 = Female, 0 = Male.	.471	(.499)
RACE1	1 = Fujianese, 0 = Otherwise.	.726	(.446)
RACE2	1 = Hakka, 0 = Otherwise.	.179	(.384)
RACE3	1 = Mainlander, 0 = Otherwise.	.078	(.269)
RACE4	1 = Aboriginal, 0 = Otherwise.	.016	(.126)
RELIG1	1 = Nonreligious, 0 = Otherwise.	.079	(.269)
RELIG2	1 = Traditional, 0 = Otherwise.	.584	(.493)
RELIG3	1 = Buddhist, 0 = Otherwise.	.298	(.458)
RELIG4	1 = Christian, 0 = Otherwise.	.039	(.194)
EDU1	1 = Informal schooling, 0 = Otherwise.	.263	(.441)
EDU2	1 = 1 to 6 years of schooling, 0 = Otherwise.	.465	(.499)
EDU3	1 = 7 to 12 years of schooling, 0 = Otherwise.	.201	(.401)
EDU4	1 = 13 to 17 years of schooling, 0 = Otherwise.	.071	(.257)
HEALTH	1 = Poor health, 0 = Otherwise.	.224	(.417)
PAGE1	1= Partner's ages below 50, 0 = Otherwise.	.145	(.352)
PAGE2	1= Partner's ages 50-54, 0 = Otherwise.	.171	(.377)
PAGE3	1 = Partner's ages 55-59, 0 = Otherwise.	.243	(.429)
PAGE4	1 = Partner's ages 60-64, 0 = Otherwise.	.221	(.415)
PAGE5	1 = Partner's ages 65 and over, 0 = Otherwise.	.220	(.414)
PRACE1	1 = Partner is Fujianese, 0 = Otherwise.	.713	(.452)
PRACE2	1 = Partner is Hakka, 0 = Otherwise.	.183	(.387)
PRACE3	1 = Partner is Mainlander, 0 = Otherwise.	.088	(.283)
PRACE4	1 = Partner is Aboriginal, 0 = Otherwise.	.016	(.124)
PEDUCATION	Partner's schooling from 0 to 17 years	5.792	(4.344)
PHEALTH	1 = Partner with poor health, 0 = Otherwise.	.198	(.399)
PENSION	1 = Eligible for a pension, 0 = Otherwise.	.249	(.433)
INCOME	Log form for last year's income	12.518	(.998)
CHILDREN	The number of children	3.833	(1.473)

Note:
The effective sample of duration model has 1869 observations, including 329 observations who divorced (included separated) or widowed, and 1540 people with continuing marriage.

Table 3 Descriptive Statistics of Variables for the Case of Divorce Only

Variables	Description	Mean	Std Err
DURATION	1-51 years.	32.206	(7.712)
CENSOR	1 = Uncensored, 0 = Otherwise.	.026	(.160)
AGE1	1= Aged 50 to 54, 0 = Otherwise.	.319	(.466)
AGE2	1 = Aged 55 to 59, 0 = Otherwise.	.324	(.468)
AGE3	1 = Aged 60 to 64, 0 = Otherwise.	.251	(.434)
AGE4	1 = Aged 65 to 70, 0 = Otherwise.	.107	(.309)
GENDER	1 = Female, 0 = Male.	.433	(.496)
RACE1	1 = Fujianese, 0 = Otherwise.	.723	(.448)
RACE2	1 = Hakka, 0 = Otherwise.	.181	(.385)
RACE3	1 = Mainlander, 0 = Otherwise.	.082	(.274)
RACE4	1 = Aboriginal, 0 = Otherwise.	.015	(.121)
RELIG1	1 = Nonreligious, 0 = Otherwise.	.082	(.273)
RELIG2	1 = Traditional, 0 = Otherwise.	.582	(.493)
RELIG3	1 = Buddhist, 0 = Otherwise.	.297	(.457)
RELIG4	1 = Christian, 0 = Otherwise.	.039	(.194)
EDU1	1 = Informal schooling, 0 = Otherwise.	.250	(.433)
EDU2	1 = 1 to 6 years of schooling, 0 = Otherwise.	.463	(.499)
EDU3	1 = 7 to 12 years of schooling, 0 = Otherwise.	.211	(.408)
EDU4	1 = 13 to 17 years of schooling, 0 = Otherwise.	.077	(.266)
HEALTH	1 = Poor health, 0 = Otherwise.	.213	(.409)
PAGE1	1= Partner's ages below 50, 0 = Otherwise.	.160	(.367)
PAGE2	1= Partner's ages 50-54, 0 = Otherwise.	.181	(.385)
PAGE3	1 = Partner's ages 55-59, 0 = Otherwise.	.248	(.432)
PAGE4	1 = Partner's ages 60-64, 0 = Otherwise.	.217	(.412)
PAGE5	1 = Partner's ages 65 and over, 0 = Otherwise.	.194	(.395)
PRACE1	1 = Partner is Fujianese, 0 = Otherwise.	.714	(.452)
PRACE2	1 = Partner is Hakka, 0 = Otherwise.	.188	(.391)
PRACE3	1 = Partner is Mainlander, 0 = Otherwise.	.083	(.276)
PRACE4	1 = Partner is Aboriginal, 0 = Otherwise.	.015	(.121)
PEDUCATION	Partner's schooling from 0 to 17 years	5.779	(4.339)
PHEALTH	1 = Partner with poor health, 0 = Otherwise.	.221	(.415)
PENSION	1 = Eligible for a pension, 0 = Otherwise.	.259	(.438)
INCOME	Log form for last year's income	12.590	(.978)
CHILDREN	The number of children	3.798	(1.452)

Note:
The effective sample of duration model has 1604 observations, including 64 observations who divorced (included separated), and 1540 people with continuing marriage.

Table 4 Estimation by Weibull Models: the Cases of Divorce and Death of Spouse

Variables	Without Unobserved Heterogeneity		With Gamma- Heterogeneity	
	Coefficient	Standard Error	Coefficient	Standard Error
AGE2	.041	(.218)	.212	(.221)
AGE3	.061	(.248)	.365	(.255)
AGE4	-.214	(.296)	.116	(.299)
RACE2	-.115	(.277)	-.089	(.275)
RACE3	.417	(.306)	.298	(.319)
RACE4	.713	(.586)	.657	(.587)
RELIG2	-.142	(.268)	-.214	(.267)
RELIG3	-.324	(.281)	-.416	(.281)
RELIG4	-.251	(.402)	-.298	(.406)
EDU2	-.041	(.162)	.167	(.169)
EDU3	-.348	(.257)	.019	(.275)
EDU4	-.687	(.465)	-.236	(.480)
HEALTH	.575***	(.150)	.596***	(.149)
PAGE2	-.214	(.339)	-.460	(.348)
PAGE3	.067	(.309)	-.363	(.328)
PAGE4	-.103	(.329)	-.787	(.368)
PAGE5	.202	(.350)	-.667	(.399)
PRACE2	-.152	(.279)	-.214	(.279)
PRACE3	-.267	(.279)	-.193	(.276)
PRACE4	.753	(.659)	.623	(.664)
PEDUCATION	.079***	(.021)	.040*	(.023)
PHEALTH	-16.473	(398.007)	-21.991	(620.445)
PENSION	.273	(.190)	.407**	(.193)
INCOME	-.548***	(.079)	-.540***	(.080)
CHILDREN	-.167***	(.052)	-.180***	(.051)
Constant	-2.273**	(1.139)	-1.851	(1.219)
$/\ln\_\alpha$	.755***	(.063)	.756***	(.061)
$/\ln\_theta$			-1.484	(1.053)
α	2.218***	(.135)	2.219***	(.130)
$1/\alpha$	.469***	(.029)	.470***	(.028)
theta			.226	(.239)
Log likelihood	-595.888		-587.754	
LR chi2(25)	242.90***		230.20***	

Notes: 1. Effects are significant at * $p \le .10$, ** $p \le .05$, *** $p \le .01$.

2. Goodness of fit: the result of Log-likelihood ratio test can reject the hypothesis that all coefficients except the intercept are 0 at the 0.01 level. In particular, Log-likelihood ratio test of theta = 0: chibar2 (01) = 16.27, Prob >= chibar2 = 0.000.

Table 5 Estimation by Weibull Models: the Case of Divorce Only

Variables	Without Unobserved Heterogeneity		With Gamma- Heterogeneity	
	Coefficient	Standard Error	Coefficient	Standard Error
AGE2	.287	(.471)	.287	(.471)
AGE3	.959*	(.553)	.959*	(.553)
AGE4	-.306	(.701)	-.306	(.701)
RACE2	-.611	(.649)	-.611	(.649)
RACE3	.517	(.569)	.517	(.569)
RACE4	1.638**	(.815)	1.638**	(.815)
RELIG2	-.528	(.475)	-.528	(.475)
RELIG3	-.926*	(.520)	-.926*	(.520)
RELIG4	.153	(.672)	.153	(.672)
EDU2	1.108*	(.578)	1.108*	(.578)
EDU3	1.575**	(.667)	1.575**	(.667)
EDU4	.525	(.930)	.525	(.930)
HEALTH	1.263***	(.360)	1.263***	(.360)
PAGE2	-.961*	(.549)	-.961*	(.549)
PAGE3	-.383	(.476)	-.383	(.476)
PAGE4	-1.412**	(.643)	-1.412**	(.643)
PAGE5	-1.079	(.756)	-1.079	(.756)
PRACE2	.292	(.520)	.292	(.520)
PRACE3	-.366	(.713)	-.366	(.713)
PRACE4	1.304	(.932)	1.304	(.932)
PEDUCATION	.097*	(.054)	.097*	(.054)
PHEALTH	-15.946	(615.569)	-15.946	(615.569)
PENSION	.331	(.418)	.331	(.418)
INCOME	-.821***	(.192)	-.821***	(.192)
CHILDREN	-.704***	(.155)	-.704***	(.155)
Constant	-2.273**	(2.391)	-2.273**	(2.391)
$/\ln\_\alpha$	3.691	(.063)	3.691	(.063)
$/\ln\_theta$			-16.554	(111.557)
α	1.202	(.174)	1.202	(.174)
$1/\alpha$	.832	(.120)	.832	(.120)
theta			6.47e-08	(.000)
Log likelihood	-173.511		-173.511	
LR chi2(25)	124.15***		124.15***	

Notes: 1. Effects are significant at * $p \le .10$, ** $p \le .05$, *** $p \le .01$.

2. Goodness of fit: the result of Log-likelihood ratio test can reject the hypothesis that all coefficients except the intercept are 0 at the 0.01 level. In particular, Log-likelihood ratio test of theta = 0: chibar2 (01) = 3.5e-06, Prob >= chibar2 = 0.499.