International Journal of Social Science & Human Behavior Study– IJSSHBS
Volume 1 : Issue 4 *[ISSN 2374-1627]*
Publication Date: 27 December, 2014

Separation as an Alternative to Divorce

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***Abstract*—This paper investigates the determinants of marital instability when separation is included as an alternative to divorce. Using the data from NLSY79, male income is a factor that significantly increases the probability of staying married. Female income, in contrast to many of the previous findings, does not destabilize marriage. It however increases the probability that divorce is chosen over separation should the marriage end. Children appear to significantly decrease the probability of divorce of women, but have no impact on the divorce probability of men. Evidence also suggests that dropping separated respondents from the estimation does not cause any inconsistency in the estimates of the other choices, but pooling separated with divorced respondents can lead to a misleading conclusion.**

***Keywords*—dynamic optimization, multinomial logit model, marital instability**

I. Introduction

Following Becker et al. (1977), a number of studies have investigated the determinants of marital instability, which include the labor market condition and the employment status of husbands and wives (Hanson and Tuch, 1994), religion (Ruggles, 1997), fertility (Koo and Janowitz, 1983) as well as a revisit of age at marriage (Booth and Edwards, 1985). To my knowledge, none of these studies has explicitly addressed separation and divorce as two different alternatives in marital status. Separated individuals are therefore either pooled with married individuals if the marital stability is determined by the legal status such that the marriage is not ended until the person is divorced, or they are pooled with divorced individuals if the marriage is considered unstable when the person stops living with his or her spouse.

This paper investigates factors that affect the marital choice of currently married individuals when there are three alternatives –married, separated, and divorced. In the model that will be formalized in the next section, married individuals decide on their marital status based on a set of explanatory variables, the signal from their spouses which affect the expectation that they form on the quality of their spouses, and the transition cost that must be paid if they decide to change the marital status. Some testable implications of the model are then tested using the data from the National Longitudinal Survey of Youth, 1979 (NLSY79). Other tests include the Hausman-McFadden IIA test to verify whether dropping separated respondents from the analysis can cause any significant inconsistency to the estimates of the remaining two choices, as well as a comparison of the results when separated respondents are pooled with the other two groups either by their legal status or their cohabitating status. All proofs are available upon request from the author.

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II. The Model

Consider a model in which married individuals who live a finite life until time T are facing the problem of repeatedly choosing their marital status m_t from a set of mutually exclusive and exhaustive choices. Let $m_t = 1$ if married, $m_t = 2$ if separated, and $m_t = 3$ if divorced, and d_t be the duration of the marriage at time t. The match quality of the spouse θ is unknown, but assumed to be drawn from a well specified probability function F_θ, whose support is $[\underline{\theta}, \infty)$, where $\underline{\theta}$ can be interpreted as a minimally accepted quality of the spouse that is known prior to the marriage. In each period, a random signal of the match quality denoted by η_t is independently drawn from an identical probability distribution function $F_{\eta|\theta}$, whose expectation is strictly increasing in the match quality.

Assumption 1 θ follows a Pareto distribution with a probability density function

$$f(\theta|\underline{\theta}, \lambda) = \lambda \underline{\theta}^{\lambda} \theta^{-(\lambda+1)}, \text{ where } \underline{\theta} \le \theta < \infty, \underline{\theta} > 0, \lambda > 0.$$

η_t follows an exponential distribution with a probability density function

$$f(\eta_t|\theta) = \frac{1}{\theta} e^{-\frac{\eta_t}{\theta}}, \text{ where } 0 < \eta_t < \infty, \theta > 0.$$

Since θ is unknown, individuals form an expectation of θ given the information of η_t that has been accumulated over the duration of marriage.

Proposition 1 Let $\hat{\theta}_{d_t}$ be the expectation of the posterior distribution of $\theta|(\eta_1, \dots, \eta_{d_t})$, then

$$\hat{\theta}_{d_t} = \frac{\sum_{t=1}^{d_t} \eta_t}{d_t + \lambda - 1}.$$

Let $S_t = (m_t, m_{t-1} d_t, \hat{\theta}_{d_t}, \eta_t)$ be the state variables that are either endogenous or stochastic, the value function at time t can be characterized as

$$\begin{aligned} V_t(S_t, x_t) = {} & f_t(m_t, d_t, x_t) + \eta_t I(m_t = 1) \\ & - \sum_{k=1}^{3} C(m_t, m_{t-1}) I(m_t = k) \\ & + \beta E_{\eta_{t+1}} \left(\max_{m_{t+1} \in F(m_t)} V_{t+1}(S_{t+1}, x_{t+1}) | \hat{\theta}_{d_t}, \eta_t \right), \end{aligned}$$

where $f_t(y_t, x_t)$ is the intermediate utility at time t, $I(\cdot)$ is an indicator function which is equal to 1 if the argument is true and 0 otherwise, $C(m_t, m_{t-1})$ is the transition cost of changing the marital status between time $t-1$ and t, $0 < \beta < 1$ is the discount factor that is assumed to be constant over time, and $F(m_t)$ is the feasible choice set conditional on m_t being chosen at time t. Note that the model can be readily

extended to include multiple or negative signals. The assumptions regarding the transition cost are as follows.

Assumption 2 $(i,j) > 0 \quad \forall i \neq j. \quad C(i,j) = 0 \; \forall i = j, \quad i,j \in \{1,2,3\}$

In words, individuals who prefer not to change their marital status do not have to pay any cost. Single individuals who wish to be separated or divorced need to pay some costs, which include both financial and emotional costs. The magnitude of these costs is not always clearly determined. For example, separated individuals who wish to reunite with their spouse tend to pay less cost than do those who are divorced. Divorcees however pay less cost if they wish to marry new people different from their previous spouses compare with separated individuals who need to pay an additional divorce cost.

It is straightforward to show that the value function can be solved by first assuming that there exists some time $\bar{t}$ such that no decision can be made after this time, and the terminal state *T*. The value function at time $\bar{t}$ is therefore reduced to

$$V_{\bar{t}}(S_{\bar{t}}, x_{\bar{t}}) = \sum_{t=\bar{t}}^{T} \beta^{t-\bar{t}} f_t(m_{\bar{t}}, d_t, x_t) - \sum_{k=1}^{3} C(m_{t-1}, m_t) I(m_t = k) + E\left(\sum_{t=\bar{t}}^{T} \beta^{t-\bar{t}} \eta_t | \hat{\theta}_{d_t}, \eta_t \right),$$

which can be recursively solved for V_t

Proposition 2 $\frac{\partial V_t}{\partial \eta_t} = 0$ if $m_t > 1$ and $\frac{\partial V_t}{\partial \eta_t} > 1$ if $m_t = 1$

It can be shown that for a married individual who considers whether to continue the relationship at time *t*, there exists a reservation value of the signal $\eta_t^*(m_t, 1)$ such that for all $\eta_t < \eta_t^*(m_t, 1)$, the value of staying married exceeds those of separation or divorce. Intuitively, a sufficiently high signal in the current period will strengthen the relationship in two ways. It first directly affects the current value of staying in the relationship. In addition, the expectation of the match quality is higher, which increases the expected value of the future value function when the marriage is sustained for another period.

Proposition 3 $\exists \eta_t^*(m_t, 1)$ such that $V_t(m_t, 1, \cdot) > V_t(1,1,\cdot)$ $\forall \eta_t < \eta_t^*(m_t, 1)$ and $V_t(m_t, 1, \cdot) < V_t(1,1,\cdot)$ $\forall \eta_t > \eta_t^*(m_t, 1)$.

Little has been said about what type of marital status is preferred should the individual decide to end the relationship. Intuitively, individuals who pay a higher divorce cost but receives the same instantaneous benefit from divorce tend to prefer separation, while those who pay the same cost but receive more benefit from divorce tend to prefer divorce.

Proposition 4 If $C(3, m_{t-1}) > C(2, m_{t-1}) > 0$ and $C(m_t, 3) > C(m_t, 2) > 0$, except for $C(3,3)$ and $C(2,2)$, and $f_t(3,\cdot) = f_t(2,\cdot)$, then

$$V_t(3, m_{t-1}, \hat{\theta}_{d_t}, \eta_t) < V_t(2, m_{t-1}, \hat{\theta}_{d_t}, \eta_t),$$

for $m_{t-1} \neq 3$. If $C(m_t, m_{t-1}) = 0$ for all possible values of m_t and m_{t-1} and $f_t(3,\cdot) > f_t(2,\cdot)$, then

$$V_t(3, m_{t-1}, \hat{\theta}_{d_t}, \eta_t) > V_t(2, m_{t-1}, \hat{\theta}_{d_t}, \eta_t),$$

for $m_{t-1} \neq 3$

The theoretical framework that has been developed so far yields a number of testable implications which can be summarized as follows.

1. An increase in positive signal from the spouse, such as an increase in income, tends to decrease the probability of ending the relationship either by separation or divorce because of two effects. The first effect is the contemporaneous effect of the signal on the value of marriage. The second effect is the effect of the current signal on the expectation of the match quality of the spouse, which in turn increases the expectation of subsequent signals.

2. Should an individual decide to end the relationship, there are two alternatives between separation and divorce. When the transition costs of divorce are relatively high, separation tends to be the preferred choice. When the benefits of divorce are relatively high, divorce tends to be the preferred choice. It is important to emphasize that with separation as an alternative to divorce, an increase in the transition cost of divorce may or may not affect the stability of marriage; too high divorce cost may lead to a higher incidence of separation rather than a higher tolerance in an unhappy marriage. This is different from the implication in the traditional models e.g. Weiss and Willis (1997), where divorce is the only choice when marital dissolution occurs.

3. The effect of an individual's personal traits, such as income and personality, on the probability of selecting any of the three choices can be ambiguous. The change in personal traits affect the contemporaneous utility to the marriage as well as the transition cost among different marital status. Little can be inferred on the theoretical ground unless a definite function from of these benefits and costs is known.

III. Empirical Evidence

This study limits the sample to those who are currently married and investigates how their chosen marital status in the next period depends on the current state variables. The reduced form of the value function is assumed to be linear:

$$V_i(m_t) = \sum_{j=0}^{k} \alpha_j(m_t) Z_{ijt},$$

where $Z_{ijt} = (X_{ijt}, C_{ijt}(m_t, m_{t-1}))$ is a *k*-dimensional vector of explanatory variables of individual *i* at time *t*, which include the contemporaneous variables and the transition cost specified in the previous section, and $\alpha(m_t)$ is a set of coefficients to be estimated. The random utility model is

$$U_i(m_t) = V_i(m_t) + \epsilon_{im_t},$$

where the latent variable $U_i(m_t)$ is the random utility received from selecting choice *m* at time *t*, and the error component ϵ_{im_t} is assumed to be identically and independently distributed with a Gumbel distribution, with the probability density function $f_\epsilon(\epsilon) = \exp(-\exp(-\epsilon))$. The probability that a particular marital status *m* is selected at time *t* is

$$\Pr(m_t) = \frac{\exp(V(m_t))}{\sum_{l \in F(m_t)} \exp(V(l))}.$$

The parameters in the model can then be estimated using the maximum likelihood estimation of a multinomial random variable

$$\ln L = \sum_{i=1}^{n} \sum_{\forall m_t} d_{imt} \ln \Pr(m_t),$$

where $d_{m_t} = I(m_t)$. The marginal change in the choice probability with respect to the change in the explanatory variable is

$$\frac{\partial \Pr(m_t)}{\partial Z_j} = \Pr(m_t)\left(\alpha_j(m_t) - \sum_{\forall m_t} \Pr(m_t)\,\alpha(m_t)\right).$$

The data used in this study is from the National Longitudinal Survey of Youth 1979 (NLSY). The survey contained an initial sample of 12,686 young men and women who were between 14 to 22 years of age in 1979. The respondents were interviewed annually during 1979 to 1994 and since 1996, have been interviewed every two years. The survey sample contains three subgroups. The first one contains 6,111 young people sampled from non-institutionalized civilians born between 1957 and 1964. The second group contains additional 5,295 individuals oversampled from black, Hispanic, economically disadvantaged non-black and non-Hispanic youth. The last group contains additional 1,280 individuals oversampled from the military. The data used in the study are from 1994 onward, which were collected on a biennial basis.

To analyze how marital decision depends on the current state variables, I will examine only the respondents who are currently married at time *t* and investigate how their marital status change at time *t* + 2, based on the state variables at time *t*. Note that since the time interval between each interview is rather long (i.e. two years), it is possible that some individuals change their marital status more than one time during the interview. These respondents will be excluded from the study. Samples are pooled from five rounds of interview during 1994 to 2002. The explanatory variables in the study are the state variables at time *t*, which include race of the respondent, age of the respondent at the time of his/her current marriage, pre-tax income from wage and salary of the respondent from previous year, pre-tax income from wage and salary of the spouse of the respondent from previous year, the total number of biological, step-, and adopted children living in the household combined, the duration of the current marriage (in years), a dummy variable that indicates whether the respondent is in his/her first, second, or third marriage, and a year dummy variable. It should be emphasized that since income incorporates both the wage rate as well as number of working hours, which is endogenous in the model, a better choice of income-related variables would be the wage rate of the respondent and the wage rate of the spouse of the respondent. The age range of the respondents is from 30 to 46. The proportion of men and women is approximately the same, although there is a large proportion of white respondents and the respondent who are in their first marriage.

TABLE I. MARIGINAL EFFECTS BY MARITAL STATUS

Variables	Male (n=9716, $logL$=-2297, $p(\chi^2)$=0.000)		
	Married	***Separated***	***Divorced***
Non-white	-190.7020**	163.3030**	27.3990
	(0.00)	(0.00)	(0.45)
Children	2.5030	2.6830	-5.1860
	(0.89)	(0.82)	(0.72)
Own income	0.0025**	-0.0014**	-0.0010*
	(0.00)	(0.01)	(0.10)
Spousal income	0.0011	-0.0016*	0.0005
	(0.343)	(0.09)	(0.52)
Marriage	26.8170**	-6.4260	-20.3910**
duration	(0.00)	(0.27)	(0.00)
Age at marriage	21.1610**	-2.1180	-19.0440**
	(0.02)	(0.73)	(0.01)

Variables	Female (n=9430, $logL$=-2121, $p(\chi^2)$=0.000)		
	Married	***Separated***	***Divorced***
Non-white	-210.2710**	187.68**	22.5900
	(0.00)	(0.00)	(0.51)
Children	7.1230	17.7860	-24.9090*
	(0.68)	(0.12)	(0.06)
Own income	0.0001	-0.0014	0.0013
	(0.96)	(0.11)	(0.41)
Spousal income	0.0041**	-0.0025**	-0.0015
	(0.02)	(0.00)	(0.37)
Marriage	40.5480**	-15.3060**	-25.2410
duration	(0.00)	(0.01)	(0.00)
Age at marriage	31.0500**	-7.1220	-23.9280**
	(0.00)	(0.26)	(0.00)

p-values are in parenthesis. Both models contain year and time of marriage fixed effects. Numbers are estimated marginal effects multiplied by 100. All estimates are evaluated at the mean except for those of dummy variables which measure the change from 0 to 1. * and ** denote statistical significance at 95 and 90 per cent, respectively.

I first fitted a multinomial logit model and summarized the marginal change in the choice probability in Table 1. White men have a statistically significant higher probability of staying married, while non-white men have a greater probability of being separated, but not divorced. Statistically significant factors that increase the probability of staying married are men's income, marriage duration, and age at current marriage. Men's income has a strongly significant effect of reducing the probability of separation and, at a lower level of significance, the probability of divorce. The duration and age at current marriage have no impact on the probability of separation, but have a statistically significant effect on reducing the probability of divorce.

For women, white women have a statistically significant higher probability of staying married than non-white women. Similar to the results found earlier among men, non-white

women have a greater probability of being separated, but not divorced. Children, which have no significant impact on any of the three marital choices of men, have a significant impact on decreasing the probability of divorce. In contrast to their men counterpart, women's own income does not have a statistically significant impact on the probability of staying married. Their spouse's income is however a highly significant factor that increases the probability of saying married, a result that confirms the conjecture in proposition 2. Both the duration of and age at current marriage are statistically significant factors that increase the probability of staying married and decrease the probability of getting a divorce.

TABLE II. SELECTED STATISTICAL TESTS

Test statistic	Male	Female
Hausman-McFadden IIA test	10.90 (0.54)	8.22 (0.77)
Wald test		
(1) $\beta_{married} = \beta_{separated}$	82.45 (0.00)	134.41 (0.00)
(2) $\beta_{separated} = \beta_{divorced}$	26.87 (0.01)	41.35 (0.00)

p-values are in parenthesis.

Does the exclusion of separation cause any inconsistencies in the estimation of the marginal effect of the other two choices? Using the Hausman-McFadden procedure, all three choices are first included in the full model while separation is dropped in the restricted model. The estimated coefficients of the two models are then tested under the hypothesis that the coefficients under both models are the same. As can be seen in Table 2, both male and female models fail to reject this test and hence separated respondents can be excluded from the data without causing any significant inconsistency to the estimated marginal probability of staying married or divorced.

I next examine whether the separated group can be combined with other groups by using Wald test of the equality between the parameters. As shown in Table 2, the hypothesis that the coefficients of the separated group are similar to those of the divorced group, and the hypothesis that the coefficients of the separated group are similar to those of the married group can be strongly rejected. Pooling separated respondents with any of the two groups can thus cause a misleading interpretation of the results.

To illustrate this argument, the results of two separated logistic regressions are provided in Table 3. First, respondents who are either married or separated are combined when the marital status is determined by their legal status. A logistic regression is run on the same set of explanatory variables. Women's income is found to be a factor that destabilizes the marriage, a result found in many of the previous studies. This is however different from result from the multinomial logit model in which women's income is not a factor that affects the probability of staying married; it rather increases the probability that divorce is preferred to separation should the marriage breaks down.

Alternatively, respondents who are either separated or divorced are combined together when the marital status is determined by the cohabitating behavior. Children are found to be a factor that does not significantly affect the marital choice, which is different from the result from the multinomial logit model in which children are a significant factor that reduces the risk of divorce.

TABLE III. MARIGINAL EFFECTS ON MARITAL DISSOLUTION

Variables	Married and separated combined		Separated and divorced combined	
	Male(1)	*Female*(2)	*Male*(3)	*Female*(4)
Race	-24.715 (0.00)	-18.392* (0.00)	214.681** (0.00)	242.198** (0.00)
Children	5.274 (0.71)	25.147* (0.05)	-0.720 (0.97)	-1.107 (0.95)
Own income	0.001* (0.06)	-0.001** (0.05)	-0.003** (0.00)	0.000 (0.78)
Spousal income	0.000 (0.52)	0.002* (0.00)	-0.001 (0.46)	-0.004** (0.00)
Duration	20.262** (0.00)	24.943*** (0.00)	-26.974** (0.00)	-41.529** (0.00)
Age at mariage	18.952** (0.01)	23.724** (0.00)	-20.739** (0.03)	-30.974** (0.00)

p-values are in parenthesis. All models contain year and time of marriage fixed effects. Numbers are estimated marginal effects multiplied by 100. All estimates are evaluated at the mean except for those of dummy variables which measure the change from 0 to 1. * and ** denote statistical significance at 95 and 90 per cent, respectively. (1) n=9430, lnL=-1140, $p(\chi^2) = 0.000$. (2) n=9716, lnL=-1126, $p(\chi^2) = 0.000$. (3) n=9430, lnL=-1812, $p(\chi^2) = 0.000$. (4) n=9716, lnL=-1957, $p(\chi^2) = 0.000$.

IV. Conclusion

This paper investigates the determinants of marital stability when separation is included as an alternative to divorce. Using a simple dynamic optimization, some testable implications are conjectured. First, the attributes of the spouse can serve as signals which one can use to update his or her expectation of the quality of the spouse, which in turn affects his or her marital choice in the future. Second, contemporaneous benefits and transition costs can play an important role in the decision over separation and divorce. Finally, personal attributes tend to have ambiguous effects, which cannot be verified on the theoretical basis unless a priori information of the function form and cost of each choice is known.

Using the data from NLSY79, men's income is a factor that significantly reduces the probability of marital dissolution. Women's income, in contrast to many of the previous findings, does not destabilize marriage. It however increases the probability that divorce is chosen over separation should the marriage end. Children appear to significantly decrease the probability of divorce of women, but has no significant impact on the probability of divorce of men. Evidence also suggest that dropping separated respondents from the estimation does not cause any inconsistency in the estimates of the remaining two choices, but pooling separated respondents with either married or divorced group can lead to a misleading conclusion.

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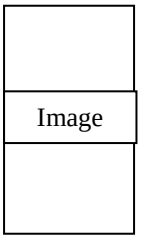

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