FOR BETTER OR FOR WORSE, BUT HOW ABOUT A RECESSION?

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ABSTRACT

In light of the current economic crisis, we estimate hazard models of divorce to determine how state
and national unemployment rates affect the likelihood of divorce. With 89,340 observations over
the 1978-2006 period for 7633 couples from the 1979 NLSY, we find mixed evidence on whether
increases in the unemployment rate lead to overall increases in the likelihood of divorce, which would
suggest countercyclical divorce probabilities. However, further analysis reveals that the weak evidence
is due to the weak economy increasing the risk of divorce only for couples in years 6 to 10 of marriage.
For couples in years 1 to 5 and couples married longer than 10 years, there is no evidence of a pattern
between the strength of the economy and divorce probabilities. The estimates are generally stronger
in magnitude when using national instead of state unemployment rates.

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INTRODUCTION

Roughly half of all marriages end in divorce. This is particularly disturbing when considering the negative effects family disruptions have on children's academic, behavioral, psycho-social adjustment and the large costs to society (e.g., Amato and Keith 1991; Scafidi 1998; Amato 2001). Historically, weak economic periods have been thought to increase the likelihood of families divorcing, as financial strains can cause considerable marital tension. Currently, the U.S. is going through what many believe is the worst economic crisis since the Great Depression. Unemployment, at over 9%, is the highest it has been since 1982, although alternative measures of unemployment that take into account those who have given up searching for a job and those who have less employment than they want suggest that this understates the severity of the problem.

Evidence on higher divorce rates during weak economic periods comes from the results of widely-cited studies showing that husband's unemployment increases the probability that a couple divorces (e.g., Hoffman and Duncan 1995). But, some anecdotal evidence from the current economic crisis suggests that couples are staying together because they cannot afford to divorce (Johnson, 2008).

Theoretically, either effect is possible. Given the high cost of divorce (from court costs and needing to fund separate residences), a weak economy could reduce the number of divorces. At the same time, a weak economy could increase divorces because of financial strain (mentioned above) and perhaps because expectations about future economic prospects could change, which could reduce the value of the marriage for some.

Whereas several studies have examined how individual economic circumstances affect the probability of divorce (e.g., Hoffman and Duncan 1995; Weiss and Willis 1997; Schoen, Astone et al. 2002; White and Rogers 2000 in a review of the prior literature), only a few studies have examined how macroeconomic factors affect the probability of divorce (South 1985; Ruggles 1997; Ono 1999). These studies were mostly based on fairly old data. In addition, the studies either used national economic data or used state economic data without any controls for state characteristics that might affect divorce rates independent from the economy's effect. Thus, period effects (when using national data) or spurious correlation of state economic factors with factors at the state level (such as different state divorce laws) could have affected the results. Furthermore, the studies did not account for potential differential effects of the economy on the likelihood of divorce at different stages of marriage. It is possible that a weak economy could hurt young marriages but have much less effect on long-established marriages, which often have survived previous recessions and other challenging times.

In this paper, we examine how the economy affects the risk of divorce with more recent data and a new approach. Using the framework of survival analysis that allows the underlying hazard of divorce to differ for each state, we estimate how changes in the economy (proxied by monthly state or national unemployment rates) affect the probability of a marriage ending in divorce. In addition, we examine differences in how changes in the economy affect the probability of divorce at various stages of marriage. We use data from the 1979 National Longitudinal Survey of Youth (NLSY-79). These data have detailed information on marital status changes along with their dates.

We find that a weak economy (as proxied by a higher unemployment rate) has different effects on the likelihood of a divorce depending on the stage of marriage. Specifically, for

couples who are in their first 5 years of marriage or who have been married more than 10 years, there is no significant relationship between the strength of the economy and their odds of divorce. However, couples in years 6 to 10 of marriage clearly have countercyclical divorce rates under various model specifications and sensitivity analyses—i.e., higher divorce rates when the economy is weaker. These results suggest that the current economic crisis is leading to more divorces for couples married 6 to 10 years.

PREVIOUS LITERATURE

Studies on factors of divorce

The typical framework for examining how certain factors affect the probability of a couple divorcing is a hazard model. This model is able to capture duration dependence (that the stability of a marriage may increase as the duration increases) and allows factors to be time-varying. That is, the economic environment or the number of children will change over time, and the hazard model allows the variables to vary for a couple over time.

The literature on the causes of divorces have identified several factors. Some of the characteristics associated with higher divorce rates are: being younger at the time of marriage, having less education, and being Black (e.g., Hiedemann et al., 1998; Steele et al., 2005; Hoffman and Duncan, 1995; Lillard and Waite, 1993).

Another important factor is the presence of children. Most of the early studies generally found that pre-school children tend to reduce the risk of divorce, but older children increase the risk—see a review of these studies by Lillard and Waite (1993) and more recent evidence by Hoffman and Duncan 1995; Weiss and Willis 1997; Steele, Kallis et al. 2005). These studies may have suffered from endogeneity in that couples who are in more stable marriages are more

likely to have children. A few studies did address the issue of endogeneity of children. However, the results of these studies were mixed (see Lillard and Waite 1993; Vuri 2003; Svarer and Verner 2008). Part of the reason for the mixed results may be some of the identifying assumptions, such as using the assumption of conditional independence.

Studies on how economic outcomes affect marital stability

There have been several studies on how individual economic factors affect the probability of a couple divorcing. The typical theory is that higher earnings for husbands tend to reduce any financial strain in the family and stabilize marriages (so, husband's unemployment could lead to divorce). However, South (1985) argued that higher family income makes divorces more affordable. Higher wives' earnings can have the same effects. In addition, Becker (1973, 1974) argued that higher-earning wives reduce the gains from specialization within the marriage (from the historically traditional roles of the husband working and the wife engaged in household production).

Empirically, estimating the effects of individual economic outcomes is difficult, as the individual economic outcomes of husbands and wives may not be exogenous to marital stability. The most likely such phenomenon is that a wife who is unhappy in the marriage may change her investments away from the household (including having kids) and towards labor market activities. That is, perhaps in anticipation of potentially getting divorced, the wife may start working towards personal financial viability. Indeed, Schoen, Rogers et al. (2006) found that unhappily married women are more likely to shift to full-time work than happily married women. Likewise, Rogers (1999) found that marital instability precedes higher earnings for wives more than *vice versa*. For husbands, being unhappily married could reduce the incentive

to work hard to provide for the family. In addition, it is possible that general instability in a marriage and the effort needed to improve marriage stability will prevent either spouse from making investments in their human capital that could lead to the greater economic prospects in the future.

Most studies did not address the endogeneity of individual economic outcomes and just assumed that the individual economic outcomes were exogenous. These studies have found consistent evidence that higher husband's earnings is associated with greater marital stability (e.g., Hoffman and Duncan 1995; Jalovaara 2003). However, the results have been mixed for wives. Some studies found that higher wife's earnings is associated with a lower probability of divorce (e.g., Hoffman and Duncan 1995, Sayer and Bianchi 2000, Schoen, Rogers et al. 2006), but others studies found that higher wife's earnings are associated with a greater probability of divorce (e.g., Suhomlinova and O'Rand 1998; Jalovaara 2003). And, Schoen, Astone et al. (2002) found that the wife's labor force participation is associated with a higher probability of divorce only among those with unhappy marriages, which is consistent with the endogeneity story from above.

A few studies attempted to address the potential endogeneity associated with economic outcomes for both spouses and marital stability, but there has not been any convincing study addressing this problem. Weiss and Willis (1997) used predicted rather than actual earnings of the husband and wife. However, the predicted earnings were based on changes over time in current labor market status, education, and fertility status. These changes, one could easily argue, are generally expected outcomes at the time of marriage, making them endogenous to the marital formation decision. Ressler and Waters (2000) estimated a simultaneous equations model for wife's earnings and divorce. However, they relied on the assumption that fertility

affects female earnings, but not the probability of divorce. Whereas Weiss and Willis (1997) found that higher wife's earnings stabilizes marriages, Ressler and Waters (2000) found the opposite result.

An alternative approach to examining how economic factors affect divorce would be to look at how divorces respond to changes in macroeconomic conditions. Using macro-level rather than individual-level economic variables avoids the endogeneity problem. There have only been three studies that have examined the role of the macroeconomy on divorces. South (1985) estimated a time-series model for the divorce rate for the 1948-79 period. In several specifications, he generally found that a higher national unemployment rate and lower Gross National Product growth are associated with higher divorce rates. This suggested countercyclical divorce rates. Ruggles (1999) estimated separate cross-sectional models and a pooled model from 11 Census' from 1880 to 1990, using local economic factors, and found that higher female labor force participation and greater growth in nonfarm employment were associated with higher divorce rates. This suggested procyclical divorce rates. And, Ono (1999) used Current Population Survey data from 1980, 1985, and 1990 to measure marriage histories over the 1950-87 period. He examined the effects of national median husbands' and wives' incomes and found that both contribute positively to the probability of separation, again suggesting procyclical divorce rates. These latter two studies stand in contrast to the results from most individual-level studies that found that higher husband's earnings reduce the chance of divorce.

One potential shortcoming of South (1985) is that there were no cohort controls or period controls other than the Korean and Vietnam wars, so that there could have been incidental correlation between the unemployment rate and any cohort or period effect. A potential

shortcoming of Ruggles (1999) and Ono (1999) is that they did not use any geographical controls. Thus, it is possible that unobserved heterogeneity could have affected the results. That is, it may be that areas with higher income had higher divorce rates due to factors spuriously correlated with income (such as low religiosity). Lastly, none of the studies (either the individual-level or the macro-level) investigated whether the effect of economy might be different for couples at different stages of the marriage.

In this study, we address these shortcomings from the previous studies by controlling for cohort and period effects and accounting for different underlying hazards of divorce across states. We analyze data that are, on average, more recent (1979 to 2006). Furthermore, the primary contribution of the current study is that it examines how the strength of the economy affects divorce rates at different stages of marriage.

THEORETICAL FRAMEWORK

We will use a simple dynamic model of marital continuation/dissolution that follows the models used by Becker, Landes et al. (1977) and Weiss and Willis (1997). The model can incorporate new information, so that it can allow changing economic conditions to affect the benefits and costs of marriage. Following these authors, we ignore the role of the initial marital formation.

In this model, marriage is a partnership in which the couple consumes goods together and makes marital-specific investments (such as children and property) that can, in theory, increase the benefits of marriage. The expected gains from marriage depend on the traits of the two partners, such as temperament and earnings capacity. But, those traits can change over time, as well as the value of the alternative to marriage. So, each partner makes continuous decisions on whether to continue with the marriage or end it.

We can use a household production function to characterize the net gains from marriage. The net gains incorporate the opportunity costs of staying married, which includes the value of the benefits of being single and the costs of divorce. The production function depends on the characteristics of the two partners ($x_{h,t}$ and $x_{w,t}$ for the husband and wife in time period t), the level of marital-specific capital (k_t, representing, for example, children and property), and the unobserved quality of the match (θ_t). All of these factors can change over time, as indicated by the t subscript. The production function for the net gains, thus, is the following:

$$g_t = G(x_{h,t}, x_{w,t}, k_t, \theta_t).$$

Let us denote a vector of the four generic inputs into the production function: $y_t = (x_{h,t}, x_{w,t}, k_t, \theta_t)$. We will suppose that y_t follows a stochastic difference equation:

$$y_t' = B y_{t-1}' + \phi_t$$

where B is a matrix of coefficients and ϕ_t is a vector of unanticipated changes to the components of y_t. So, each value of the components of y_t depends on the value from the previous period plus any unanticipated shock.

Let $V_t(y_t)$ denote the net gains to continue the marriage in period t. Using β as a discount factor less than one, the value function can be written as:

$$V_t(y_t) = G(y_t) + \beta * E[V_{t+1}(y_{t+1})].$$

A couple will stay married if $V_t(y_t)$ is greater than zero and divorce if $V_t(y_t)$ is less than zero. Using backward recursion to solve for V_t, this divorce-decision rule will depend on the values each period of the characteristics of each spouse (including earnings capacity), the marital-specific investments (again, children and property as the prime examples), the match quality (which is unobserved), and any factors causing changes to these characteristics, investments, and quality.

Operationally, as we described above, many of the individual characteristics of the husband and wife (such as earnings) and the investments are not exogenous, as the commitment to the marriage could dictate investments in children and property and, particularly, the wife's earnings capacity. However, the measure of the aggregate economy should be purely exogenous.

One mechanism for how the economy would affect the probability of divorce would come through the economy's effects on the husband's and wife's employment outcomes and earnings capacity. A stronger economy would increase the chances of employment for both, and with that, would likely be associated with higher earnings. Higher earnings among either the husband or wife could reduce the risk of divorce by reducing financial strain on the family, thereby reducing marital tension. Furthermore, having higher earnings would allow the couple to make marital-specific investments, such as buying a home or going on vacations, which could increase the long-term benefits of marriage and, perhaps, discourage divorce (Becker, Landes et al. 1977). Based on these mechanisms, a strengthening economy would reduce the probability of divorce.

At the same time, other mechanisms could cause a strengthening economy to lead to a higher probability of divorce. Divorces are costly, with most of those costs coming from court

expenses and having to support two residences instead of one. A stronger economy would then allow a married couple to more easily absorb these costs of divorces.

The increased earning power of the wife (from a stronger economy) would have the same effects as discussed above for its contribution to family income, but it could also more directly reduce the costs of divorce for a woman by making her economically viable on her own. That is, she would be less reliant on her husband for economic support after the divorce.

In summary, the strength of the economy could affect a married couple's decision to continue or dissolve a marriage through several mechanisms as discussed above. It is impossible to distinguish between all the mechanisms due to the endogeneity of individual factors. Our goal is to estimate the total effect of the economy, proxied by the monthly state or national unemployment rate, on the marriage survival while controlling for the factors that are deemed important to the marriage production.

METHOD

Data

The data for this analysis come from the NLSY-79, which started with 12,686 individuals who were between 14 and 22 years old at the time of the first interview in 1979. The subsequent interviews were annual through 1994, at which point they became biennial. We use data through the 2006 round. The survey included supplemental samples of military (which we exclude due to having a small sample and not having enough years of observation), minorities (Blacks and Hispanics), and low-income non-minority youth. We apply sample weights to produce a nationally representative sample.

The NLSY-79 has very detailed information on the actual year/month of all marriages and divorces. This allows us to estimate the survival models based on the timing of the divorce relative to anniversaries. Furthermore, we can take advantage of monthly unemployment rates timed to the dates of marriage for a couple and not have to rely just on annual unemployment rates. The NLSY-79 also has detailed demographic and family factors, such as the couple's educational status, state of residence, and the number and ages of children. The state information can be used to match monthly state-level economic data.

For the measures of the economy, we use two different types of unemployment rates obtained from the Bureau of Labor Statistics' website (www.bls.gov/data). In one set of models, we use monthly state unemployment rates. In another set of models, we use monthly national unemployment rates. The advantages of each are described below.

Sample

From the 12,686 NLSY-79 respondents, we first exclude 1280 respondents (10.1%) who were part of the military sub-sample, as they were dropped from the NLSY-79 after the 1984 survey round. The sample then takes the 7972 respondents who had their first marriage between 1978 (one year before the first interview) and 2005, which drops 30.0% of the remaining sample. This allows information on husband and wife education and children to be included for the first year of marriage. Marriages in the prior years would not have this information. We exclude marriages occurring in 2006, as we would not observe the completion of the first year of marriage for these people, although we still use observations from 2006 on whether marriages ended in divorce. We then exclude 197 couples (2.5%) who were married for less than one year, as they would not have a lagged unemployment rate during their marriage. Finally, 142 couples

(1.8%) were dropped for not being in a state or the District of Columbia in any observed year of marriage. Creating one observation for each year of marriage for each couple, our final sample is a panel of 89,340 observations for 7633 couples, with each observation for a given couple representing one year of marriage. All models are weighted by the original 1979 sample weight.

Empirical Models

Following the standard literature on survival analysis, we analyze the hazard of divorce using a proportional hazard model. The proportional hazard framework is the natural choice to examine marriage survival. It is nonparametric, and thus, we do not have to assume *a priori* whether the marriage survival rate has a positive or negative dependence on time. The advantage of the NLSY-79 data is that it records the actual month/year in which the marriage and divorce occurred (if the marriage ends during the study period). This allows us to determine if the couple reaches each anniversary, which allows us to use the standard Cox proportional hazard model (proposed originally by Cox 1972) .

In the proportional hazard framework, for each couple we define one-year intervals during which we can observe marital status. A couple enters the model on the day of their marriage (denoted as t_0). We would denote their subsequent wedding anniversaries as t_1, t_2 and so on. Couples who were married during the study period and stayed married at the end of the study period are censored at the end.

In the econometric model, the probability that couple *i* got divorced given that they were married up until a given anniversary is described by the following hazard function, $\lambda_i(t)$:

$$(1) \quad \begin{aligned} &\text{Prob(couple } i \text{ got divorced by anniversary } t \mid \text{stayed married until anniversary } t\text{-}1) \\ &= \exp(\beta_1 UR_{it} + \beta_2' X_{it} + \beta_3' S_{it} + \beta_4' Y_{it}) \lambda_0(t) \end{aligned}$$

where

$\lambda_0(t)$ = the baseline hazard rate for divorce for 0 to 12 months prior to anniversary t;

UR_{it} = the 12-month average unemployment rate for the year leading up to anniversary

t-1 (i.e., 13-24 months prior to anniversary t);

X_{it} = a vector of individual and family characteristics as of anniversary t-1;

S_{it} = a vector of state indicators as of anniversary t-2;

Y_{it} = a vector of year-group indicators for anniversary t.

In essence, the model examines whether the average unemployment rate in the 12 months preceding anniversary t-1 affects the probability of a divorce in the (t-1, t] period, given that the couple stayed married up to t-1. See Figure A-1 in the Appendix for a timeline example of when we measure the outcome and the unemployment rate. Note that we do not use the unemployment rate for 0-12 months prior to anniversary t because much of that would occur after the divorce—that is, on average, those divorcing would do so 6 months prior to the next anniversary, so unemployment rates for 0-12 months prior to the anniversary would partly reflect the economy after the divorce decision is reached. The state indicators, S_{it}, are based on the state the couple lived in as of t-2, which is the beginning of the 12-month period (in which the unemployment rate is measured) preceding the year of marriage leading to anniversary t. The state indicators control for differences in underlying divorce hazards across states that may be incidentally correlated with the unemployment rates. This will capture time-invariant differences in divorce rates across states due to state policies/culture unrelated to unemployment. Hardly

any divorce policies (e.g., unilateral divorce laws) changed during our time of analysis, so state dummy variables should capture most of the state differences attributable to these policies. The year-group indicators, Y_{it}, capture differences in divorce rates for the period (more details below).

There is an initial set of four models using various sets of one-year-lagged unemployment rates. A second set of four models will repeat the first set, but also include two-year-lagged unemployment rates. Model 1 uses the one-year-lagged unemployment rate for the state of residence of the couple, with the state of residence being that as of the interview prior to when the unemployment rate is measured (i.e., the year preceding the current year of marriage). The *state* unemployment variables differ across couples due to variation in marriage dates and state of residence—if two couples from the same state got married in the same year/month, they would have identical values for the unemployment rates.

Model 2 uses the equivalent of a spline function, in which we have the one-year-lagged state unemployment rates for three groups based on the length of marriage: in years 1 to 5 of marriage, in years 6 to 10, and in years 11 or more. We had broken down the later years (beyond 10 years of marriage) in more detail, but there was little difference between the estimates for those groups and the sample gets smaller, so we just grouped them for greater precision. Model 2 allows for an examination of whether unemployment rate might have different effects on a couple's divorce hazard depending on the stage of their marriage. In this model, the likelihood of divorce for couples in the first 5 years of marriage are compared to other couples in the first 5 years of marriage facing different state unemployment rates; and the same comparisons are made for the other two stages of marriage.

Models 3 and 4 are the same as Models 1 and 2, but they use the national unemployment

rate instead of the state unemployment rate. The *national* unemployment rate just varies across couples based on the timing of the anniversaries. The national unemployment rate has advantages over the state unemployment rate in that it is less subject to measurement error and it represents the whole country, as people can always move to an area with better economic conditions. The drawback to using the national unemployment rate is that there could be incidental correlation of the unemployment rate with cohort or period effects (from the time at marriage or the year of analysis), which could include national events such as campaigns to strengthen marriages or tax changes affecting marriage incentives. Controlling fully for the time periods would take away all variation in the national unemployment rate. Instead, we address this by including the year-of-analysis and year-of-marriage indicator variables in three-year groups.

Models 5 to 8 then repeat Models 1 to 4, while adding the equivalent two-year-lagged unemployment rates to the model. This is meant to determine if further lags matter and even are more important than the one-year-lagged unemployment rate. However, there could be a high correlation between the state one-year and two-year-lagged unemployment rates, which could cause multicollinearity, resulting in biased estimates and inflated standard errors.

Other Explanatory variables

In terms of demographic characteristics that might systematically affect divorce rates, some information is only available for the NLSY-79 respondent, whereas other information is available for both the respondent and his/her spouse. The information only available for the respondent includes the respondent's race (we use indicators for being Black and Hispanic),

religion, attendance at religious services, and the respondent's percentile score for the Armed

Forces Qualification Test (AFQT, a measure of aptitude).

The information that is also available for the spouse includes age at the time of marriage

and education. For age at the time of marriage, we use indicators for 3-year age groups to

improve the precision of the estimates. For education, we use non-mutually-exclusive indicators

for having a high school diploma and a bachelor's degree. For these variables that are available

for the spouse, we create separate variables for the husband and wife so we can examine whether

certain factors are more important for the husband or wife. We also include a variable for

whether the NLSY79 respondent is the husband or the wife. The information on the spouse's

age, high school diploma status, and bachelor's degree status were missing for about 7%, 8%,

and 21% of the sample, respectively. In such cases, we assign the following values for the

spouse: an age where the husband is two years older than the wife (consistent with current

statistics), having a high school diploma, not having a bachelor's degree, and having an AFQT

percentile score of 50 (the median). Furthermore, we include indicator variables for having

missing information on the age-at-marriage, high school diploma, and bachelor's degree for both

the husband and wife.

As noted above, the model also includes indicators for 3-year groups for the year of

marriage cohort and for the year of analysis (e.g., for the year of analysis, evaluating whether the

couple survived the 8th year of marriage, the model controls for what 3-year group the 8th

anniversary fell in). It should be noted that the year-of-marriage variables, the year-of-analysis

variables, and the age-at-marriage variables are highly correlated with each other. Thus, the

estimates on them (which we do not present) would be difficult to interpret, but they should

serve, together, as a good set of control variables.

RESULTS

Table 1 shows the descriptive statistics for the variables used in the model, other than the missing-variable, year-of-marriage, year-of-analysis, age-at-marriage, and state indicator variables. However, the raw age at marriage (which is used to create the indicator variables) is included in Table 1. The average age at marriage was 25 for husbands and 23 for wives.

Figure 1 shows the unadjusted survival probability of marriage. By 10 years of marriage, over 25% of couples have divorced. By 20 years, over 40% have divorced. And by the end of our data at 29 years, the likelihood of being divorced is just over 50%. Note that the percentage of couples in our analysis that divorce will be less than that figure because most are censored long before reaching 29 years of marriage. The divorce rates vary by the stage of marriage. In the first 5 years of marriage, the annual divorce rate is 3.8%, on average. It slows to 2.9% for those in years 6 to 10 of marriage. And, the divorce rate is 2.0%, on average, beyond 10 years of marriage.

Table 2 shows the coefficient and hazard ratio estimates, along with the standard errors, for the first two models, using the state unemployment rates. First, we will discuss the results other than the unemployment rates, all of which are stable across the models. Having children under age 6 reduces the hazard of divorce by 75%, as does having children over 6 years old ($p < 0.01$). Relative to not having a high school diploma, having a diploma has hardly any effect on the hazard of divorce, but either spouse having a bachelor's degree significantly reduces the hazard of divorce, more so for females (by 30%; $p < 0.01$) than for males (by 21%; $p < 0.01$). Relative to the NLSY respondent being non-Black and non-Hispanic, Black respondents have just about the same risk of divorce, while Hispanic respondents have about a 27% lower hazard

of divorce (p < 0.01). A higher AFQT score of the NLSY respondent is not significantly

associated with a different probability of divorce. Relative to those without a religion, Catholics,

Baptists, and other Christians have about the same divorce hazard. Jewish people have about

55% lower hazard of getting divorced (p < 0.05). And, those who reported having other religions

do not have significantly different hazards of divorcing compared to the reference group. The

frequency of religious attendance has no significant effect on divorce probabilities. For space

considerations, we do not show the coefficient estimates for the missing-value-indicator

variables and the year-of-marriage, year-of-analysis, age-at-marriage variables, and state. As

mentioned earlier, there is high multi-collinearity between many of these indicator variables, so

their purpose is just to serve as control variables.

Model 1 uses the one-year-lagged *state* unemployment rate as a measure of the economy.

The hazard on that variable is statistically insignificant. However, as seen in Model 2, the effect

is not the same for all stages of marriage. There is no effect for couples in the first 5 years of

marriage. But, the effect is positive for those in years 6-10 of marriage. In particular, the 1.07

hazard ratio (p < 0.01) has the following interpretation: if we were to compare two identical

couples in this group, where the only difference in their observed characteristics is one-

percentage-point difference in the unemployment rate during the prior year of marriage, then the

couple facing the higher unemployment rate is estimated to be 1.07 times more likely to divorce

in the year than the other couple. This indicates a countercyclical divorce hazard for this group.

For couples in the 11th or greater year of marriage, the effect of the state unemployment rate is

statistically insignificant.

Table 3 presents the estimated hazard ratios and standard errors of just the unemployment

rate variables for all models, including a repeat of Models 1 and 2. In Model 3, using the

national unemployment rate, a higher unemployment rate is estimated to increase the odds of divorce for all couples. A one-percentage-point increase in the unemployment rate increases the hazard of divorce by 1.07 times (p < 0.05). Again, when broken down by the stage of marriage in Model 4, the effect is positive and significant for couples in years 6 to 10 of marriage (hazard ratio=1.22, p < 0.01), but insignificant for couples in their first 5 years of marriage or married longer than 10 years.

To give perspective on the different estimated effects from state and national unemployment rate, those in years 6 to 10 of marriage have an annual 2.9% divorce rate, on average. If the odds increased by 1.07 times then they would have a 3.1% divorce probability each year. If the odds were increased by 1.22 times, then the annual probability of divorce would increase to 3.5%.

Models 5 to 8 add the two-year-lagged unemployment rates (for the state of residence as of *t-3*). In Model 5, we include the state one-year and two-year-lagged state unemployment rates. Neither is statistically significant. However, when interacting the unemployment rate with the three stages of marriage, we get the same qualitative result for the one-year-lagged unemployment rate—that a higher unemployment rate leads to a greater probability of divorce for those in years 6 to 10 of marriage, but no effect on couples in the other stages of marriages. The increased probability of divorce of 12.3% for those in years 6 to 10 of marriage is nearly double the equivalent estimate in Model 2, but the difference may be due to being highly correlated with the two-year-lagged unemployment rate for the same group, which has a negative (albeit insignificant) odds ratio. None of the hazard ratios for the two-year-lagged unemployment rates are significant.

Using the national unemployment rates, neither odds ratio on the lagged unemployment

rates are significant in Model 7. But again, Model 8 produces a similar result as in Model 6, with the effect being significant for the one-year-lagged unemployment rate for those in years 6 to 10 of marriage and not for the other groups.

In a sensitivity analysis, we estimate the same set of models without variables representing having children below age 6 and having children age 6 or older. Including them seems standard, as the number of kids could affect whether a couple stays together or not. However, due to the endogeneity mentioned earlier, controlling for the number of children could cause econometric problems. Specifically, having children is indicative of how stable the marriage is, so controlling for children could explain much of the variation in the hazard of divorce, leaving less variation that could be explained by the other variables, such as the unemployment rate. The results from the models turned out to be very similar. Because the results from these sensitivity analyses are similar, we do not report them, but they are available upon request.

DISCUSSION

One of the motivating factors for this analysis is the current economic crisis. If we wanted to know how the crisis was affecting divorce rates, we cannot just look at whether divorces have changed, as cohort effects, current-period effects, and demographic shifts may also be affecting divorce rates. An examination of relatively recent historical data, however, should provide a good indication of how this economic crisis is affecting marriage stability.

We find, using national-level, but not state-level, unemployment rates, that overall divorces are more likely when the unemployment rate is higher (i.e., the economy is weaker). This result is consistent with the time-series findings from South (1985) of countercyclical

divorces, based on data from the post-WWII period through the late 1970s. However, it stands in contrast to the cross-sectional and panel findings of procyclical divorces by Ruggles (1999) and Ono (1999).

We take the analysis to the next step by examining how the strength of the economy affects the likelihood of divorce at different stages of marriage. The estimates, using both state-level and national-level unemployment rates, indicate that couples in years 6 to 10 of marriage have countercyclical divorce probabilities. There is no evidence for any such pattern for couples who are in their first 5 years of marriage or who have been married more than 10 years.

The primary mechanism contributing to countercyclical divorce rates is likely weak economies causing financial strain; and the primary mechanisms contributing to procyclical divorce rates are strong economies causing marriages to have less benefits from specialization (with both spouses more likely to be working and not as devoted to household production) and divorces being more affordable.

For couples in years 6 to 10 of marriage, it appears that the financial strain from weak economic periods has a greater toll on the marriage, as the countercyclical forces dominate the procyclical forces. For couples in their first 5 years of marriage, perhaps some of these effects cancel each other out or are very small. We speculate that young couples would be less likely to have children and less likely to have mortgage payments, so they may be able to better withstand unemployment experiences. For couples married more than 10 years, there are two potential explanations for their ability to withstand the economic crisis. First, it is possible that marriages that last that as long as 10 years are stable enough that they would not be affected by financial problems. Second, these older couples would have more expensive housing needs (from having children and higher standards as they get older), so that the weak economy affects the

affordability of divorces more for couples in this category, perhaps counteracting the effects of the financial strain when the economy is weak.

The main point from this research, however, is that the current economic crisis is probably not affecting the stability of marriage for newly-married or long-lasting couples, but the economic crisis is likely causing more divorces for couples in years 6 to 10 of marriage.

Table 1. *Descriptive Statistics of Key Variables (n=89,340)*

Variable	Mean	Std. Dev.
Unemployment rate		
1-year-lagged unemployment rate (state level)	6.122	1.983
1-year-lagged unemployment rate (national level)	6.106	1.333
2-year-lagged unemployment rate (state level)	6.237	2.054
2-year-lagged unemployment rate (national level)	6.185	1.373
Couple characteristics		
Have children under 6 years old	0.443	0.497
Have children 6 or older	0.440	0.496
Husband has a bachelor's degree	0.246	0.431
Wife has a bachelor's degree	0.247	0.431
Husband has a high school diploma	0.904	0.294
Wife has a high school diploma	0.932	0.253
Age of husband at time of marriage	25.43	5.23
Age of wife at time of marriage	23.49	4.78
Year of marriage	1984.62	4.73
NLSY respondent characteristics		
Black	0.102	0.303
Hispanic	0.063	0.243
AFQT percentile score divided by 10	5.157	2.794
Male	0.480	0.500
Catholic	0.350	0.477
Baptist	0.208	0.406
Other Christian	0.286	0.452
Jewish	0.016	0.125
Other religion	0.103	0.304
In 1979, attended religious services at least once per week	0.466	0.499
In 1979, attended religious services, but less than once per week	0.358	0.479

Note: These statistics are weighted based on sample weights.

Table 2: Cox *Proportional Hazard Model Results on Divorce: 1979-2006*

	(1)			(2)		
	Overall			By stage of marriage		
	B	$SE\ B$	e^B	B	$SE\ B$	e^B
Unemployment rate variables						
1-year-lagged state unemployment rate	0.016	0.018	1.016			
(1-year-lagged unemp. rate) x (being in years 1-5 of marriage)				-0.006	0.022	0.994
(1-year-lagged unemp. rate) x (being in years 6-10 of marriage)				0.068[**]	0.024	1.070
(1-year-lagged unemp. rate) x (being in years 11 or more of marriage)				-0.017	0.038	0.984
Couple characteristics						
Have children under 6 years old	-1.423[**]	0.060	0.241	-1.425[**]	0.060	0.241
Have children 6 or older	-1.501[**]	0.078	0.223	-1.498[**]	0.078	0.224
Husband has a bachelor's degree	-0.235[**]	0.086	0.791	-0.236[**]	0.086	0.790
Wife has a bachelor's degree	-0.364[**]	0.091	0.695	-0.362[**]	0.091	0.696
Husband has a high school diploma	-0.061	0.090	0.941	-0.058	0.090	0.943
Wife has a high school diploma	0.072	0.093	1.075	0.072	0.093	1.075
NLSY respondent characteristics						
Black	-0.019	0.071	0.981	-0.018	0.070	0.982
Hispanic	-0.310[**]	0.077	0.733	-0.306[**]	0.077	0.736
AFQT percentile score/10	-0.079	0.075	0.924	-0.080	0.075	0.924
Male	-0.018	0.011	0.983	-0.018	0.011	0.982
Catholic	-0.003	0.128	0.997	-0.002	0.128	0.999

Baptist	0.013	0.127	1.013	0.014	0.127	1.014
Other Christian	-0.041	0.126	0.960	-0.040	0.126	0.961
Jewish	-0.793*	0.402	0.453	-0.804*	0.403	0.447
Other religion	0.145	0.134	1.156	0.145	0.134	1.156
In 1979, attended religious at least once per week	0.068	0.066	1.070	0.068	0.066	1.070
In 1979, attended religious services, but less than once per week	-0.076	0.073	0.927	-0.075	0.073	0.928

Note: e^B indicates the estimated hazard ratio. The models are weighted and also include state indicator variables, three-year-group-indicator variables for age-at-marriage, year-of-marriage, and year-of-analysis, and indicators for missing variables for the AFQT scores, education variables and age at marriage. The excluded category for religion was "no relgion," and the excluded category for religious-service attendance was "no attendance in the past year." The sample sizes for both models are 89,340.
*p < .05. **p < .01.

Table 3. *Summary of the effects of unemployment rates on the hazard of marriages ending in divorce for all models*

	Using models with 1-year lags				Using models with 1-year and 2-year lags			
	Using state unemp. rates		Using national unemp. rates		Using state unemp. rates		Using national unemp. rates	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Unemployment rate variables								
1-year-lagged unemployment rate	1.016		1.073**		1.028		1.018	
	(0.018)		(0.035)		(0.0321)		(0.057)	
(1-year-lagged unemp. rate) x (being in years 1-5 of marriage)		0.994		1.012		0.975		0.971
		(0.022)		(0.040)		(0.041)		(0.072)
(1-year-lagged unemp. rate) x (being in years 6-10 of marriage)		1.070***		1.220**		1.123**		1.174*
		(0.025)		(0.051)		(0.046)		(0.079)
(1-year-lagged unemp. rate) x (being in years 11 or more of marriage)		0.984		0.942		0.984		0.843
		(0.038)		(0.065)		(0.069)		(0.086)
2-year-lagged unemployment rate					0.977		1.076	
					(0.028)		(0.059)	
(2-year-lagged unemp. rate) x (being in years 1-5 of marriage)						0.997		1.034
						(0.038)		(0.071)
(2-year-lagged unemp. rate) x (being in years 6-10 of marriage)						0.941		1.067
						(0.038)		(0.075)
(2-year-lagged unemp. rate) x (being in years 11 or more of marriage)						0.988		1.165
						(0.065)		(0.117)
Number of observations	89,340	89,340	89,340	89,340	79,783	79,783	79,783	79,783

Note: The figures represent hazard ratios and standard errors in parentheses. The models also include all of the variables listed in Table 2 and the other variables indicated in the notes for Table 2. The sample size is lower for Models 5-8 because observations are dropped for the second year of marriage (since the two-year-lagged unemployment rate would be from before the marriage and the state at time $t-3$ was not observed.
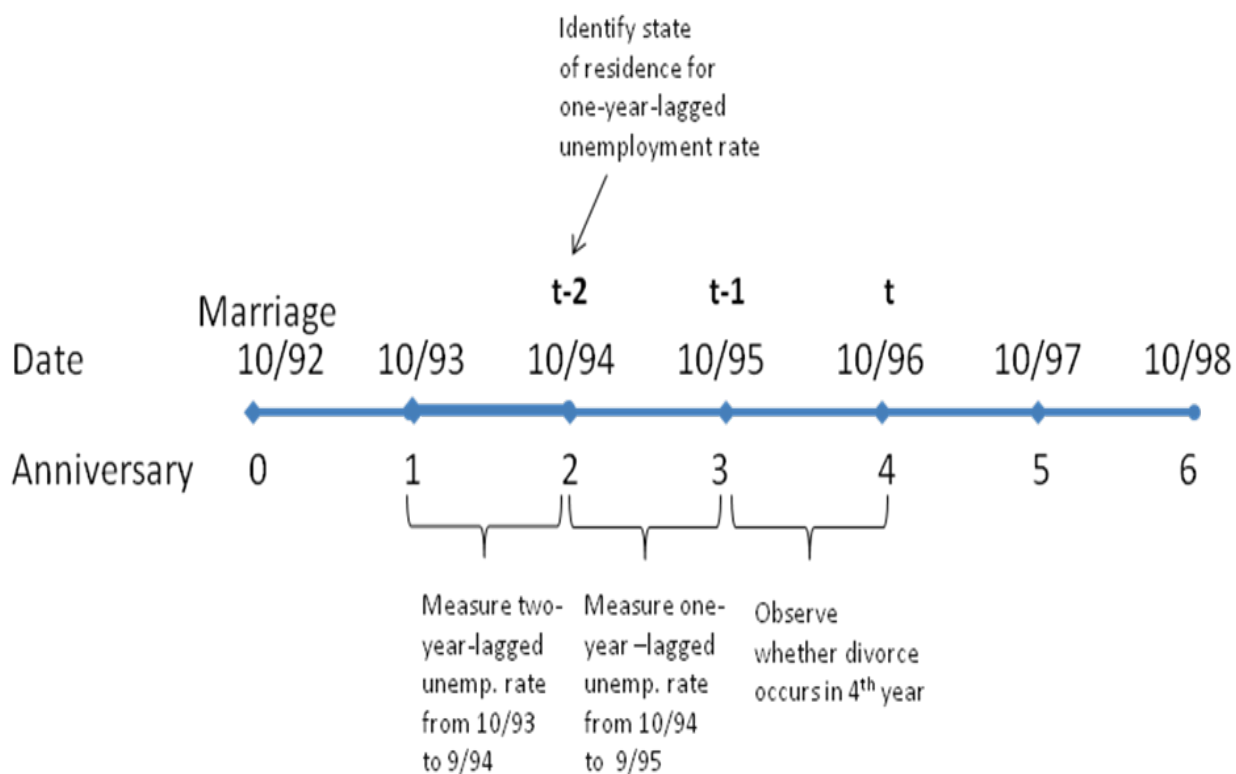*$p < .05$. **$p < .01$

Figure 1. *Unadjusted Survival Probability of Marriage.*
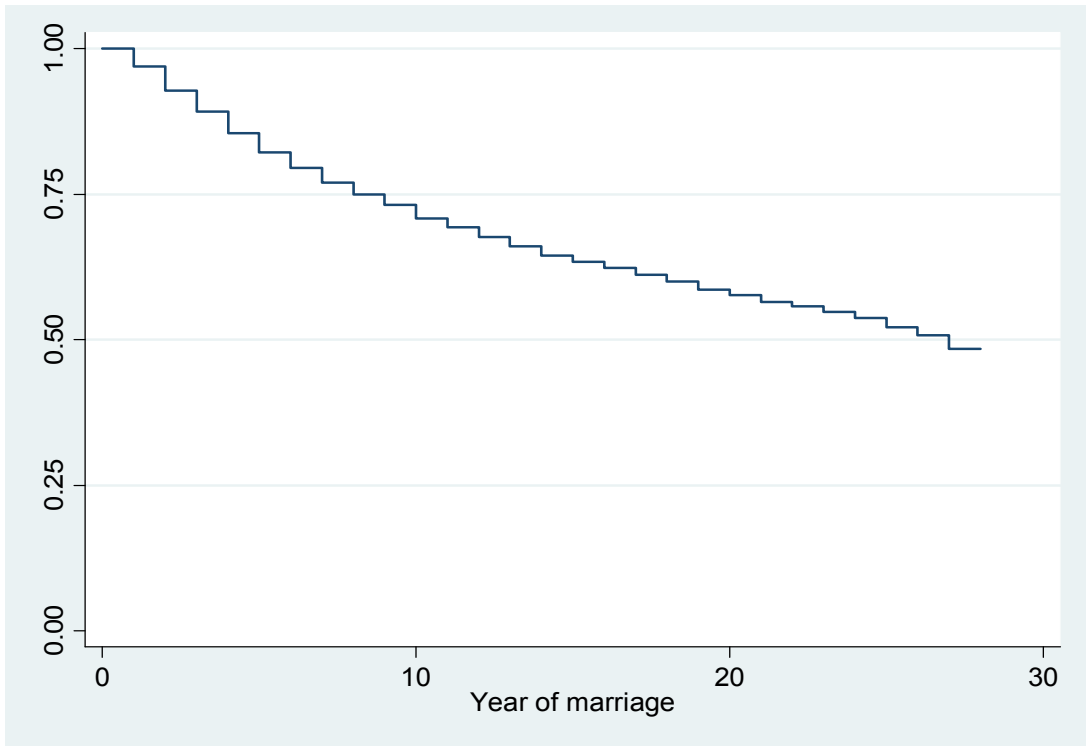
APPENDIX

FIGURE A-1. Example of the timing of measuring a divorce and the unemployment rate

In this example, the couple got married in October 1992. We set up here the observation on whether they divorce in the 4th year of marriage (between 10/95 and 10/96). We use the one-year-lagged unemployment rate measured as the average unemployment rate in the 3rd year of marriage (10/94 to 9/95). And, we use the state of residence as of 10/94 (*t-2*) to determine the state unemployment rate. The same story applies for calculating the two-year-lagged unemployment rate.

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