A simple search model of the marriage market

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This document is intended to be an informal presentation of the model that motivates our work in “Stand together or alone? Family structure and the business cycle in Canada”, accepted for publication at the Review of Economics of the Household.

In what follows, we have laid out a very simple search-theoretic model of the marriage market. We adopted some features of the modelling structure presented in Chapter 10 of Browning et al. (2011), and allow for unemployment to enter the model. Our aim is to offer a simple model that can help structure how we think about business cycle effects on marriage, divorce, and remarriage decisions. There are several aspects of the modelling exercise that are quite stylized, but we have tried to keep our model as simple as possible to ensure the mechanisms at work are as transparent as possible. We note several assumptions could be modified to provide a richer model that allows us to analyze a broader set of decisions and aggregate outcomes, however slight modifications to several key assumptions would not qualitatively change the model predictions we are most concerned with.

1 General Structure and Timing

There are two periods to each person’s lifetime.

• In period 1:
  − There are an equal number of unattached males and females in the world, for a total of $LF$ individuals. All individuals are labour force participants and will be either employed (E) or unemployed (U).
  − At the beginning of the first period, a fraction $u_1$ of all individuals are unemployed. When employed, individuals earn $Y_1^E$. When unemployed, individuals have an

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income $Y^U_1 \leq Y^E_1$ which can be thought of as unemployment benefits. $u_1$ fully describes business conditions in the first period.

- Random matches in the marriage market are made, and the quality of the potential match is $\theta$ (which is fully observed). $\theta \sim G(\theta)$ which is symmetric with mean zero.

- Individuals make the decision whether to marry or not. Where matched individuals disagree about whether to get married, a marriage will not occur.

- We assume all married individuals will have children. The child production cost is $c$, and the utility associated with the child is experienced in the second period.

- We assume that all goods within a household (consumption, match quality and own children) are public and enjoyed equally by both partners. This assumption sets aside all issues surrounding conflict and bargaining. There are no savings.

- At the end of the period, unemployed individuals may find a job (with an exogenous job finding rate equal to $f$) and employed individuals may be separated from their jobs (with an exogenous job separation rate equal to $s$). As such, total unemployment at the end of period 1 is given by

$$U_2 = u_1 LF + s(1 - u_1)LF - fu_1 LF$$

and the unemployment rate for period 2 is given by

$$u_2 = s + (1 - s - f)u_1$$

Note that $u_2 = u_1$ whenever $u_1 = s/(s + f)$, which is the usual steady-state unemployment rate.

- Married individuals, having observed the employment outcomes of their spouses, will decide whether to divorce or stay married. We assume there are no direct costs (e.g. lawyer fees) to get divorced.

- In period 2:
  - If employed, individuals will earn $Y^E_2$. If unemployed, individuals have an income $Y^U_2$.
  - If individuals stay married, own utility of any children in a home with both (natural) parents is $q^*$
  - If divorced, individuals enter the pool for potential remarriage. If divorced, children offer utility $q^o < q^*$ to their natural parents.
  - Individuals who did not marry in the first period are also in the pool for marriage in the second period.
  - All unattached (never married and divorced) individuals enter the marriage market and if they meet someone, they draw the potential match quality $\theta \sim G(\theta)$.

The second period’s match quality $\theta$ is independent of the first period’s match quality.
– Matched individuals decide whether to marry/remarry or remain single in the second period.
– Individuals are not able to produce children in the second period.
– Everyone dies at the end of the second period.

The conditions $u_1$, $s$, $f$ are treated as exogenous and can be viewed as representing business cycle conditions. $u_1$ determines the conditions for period 1 while $s$, $f$ will determine the conditions for period 2 given the conditions that existed in period 1.

Note that the likelihood of being unemployed in period 2 depends on an individual’s employment status in period 1. Those employed in the first period will find themselves employed in the second period with probability $(1 - s)$ and unemployed with probability $s$. Those unemployed in the first period will find themselves employed in the second period with probability $f$ and unemployed with probability $(1 - f)$.

To keep things simple, we are only considering the decisions of one birth cohort at this time. The model could be extended as an over-lapping generations model that allowed new cohorts to be born each period, but restricted marriages to only occur within a cohort, without changing the key predictions we consider below. A richer over-lapping generations model would allow us to consider how changes to business conditions affect broader aggregates such as the proportion of all individuals (young and old) married at one point in time. The single-cohort model restricts us to a discussion of decisions within each period, taking past decisions as given.

2 Solving the model

We start with the last available choice and work backwards through the model. First, if a person is divorced, what are the conditions under which they will choose to remarry. Second, given that they married in the first period, will they divorce or stay married given their employment outcomes going into the second period. They will consider what will be available in the pool of unattached individuals. Third, given the match made in the first period, should they get married now or wait until the second period to enter the unattached pool.

2.1 Last stage: remarriage / first (late) marriage

At the beginning of the second period, a person is aware of their own employment status $(j = E, U)$ for the second period. If they had divorced, they would have entered the pool of unattached people and searched for a new match. Random matches are made in the marriage market. If they meet someone, their utility associated with getting married depends

\[1\] In part, this will capture the lasting effects associated with entering the labour market during recessions (see Oreopoulos, von Wachter and Heisz 2006).
on their own employment status and the potential match’s observable employment status \((k = E, U)\).

The divorced individual with employment status \(j\) has the following potential utilities for the second period:

\[
\begin{align*}
\text{single} & \rightarrow Y^j_2 + q^o \\
marry E & \rightarrow Y^j_2 + Y^E_2 + q^o + \theta \\
marry U & \rightarrow Y^j_2 + Y^U_2 + q^o + \theta
\end{align*}
\]

For those who did not marry in the first period, \(q^o\) is set to zero. An individual with employment status \(j\) will marry an employed person if \(\theta \geq -Y^E_2\), and will marry an unemployed person if \(\theta \geq -Y^U_2\).

From this we can define the probabilities of marrying each type of person conditional on having met them as:

\[
\begin{align*}
\gamma^E &= 1 - G(-Y^E_2) \\
\gamma^U &= 1 - G(-Y^U_2)
\end{align*}
\]

We note that \(\gamma^U \leq \gamma^E\) by definition of a CDF. This means individuals are more likely to remarry if they meet an employed person rather than an unemployed person. This is rather intuitive - a person is willing to trade off some quality for the higher income. Note that during a recession (higher \(u^2\)), fewer employed individuals are expected in the pool of unattached individuals so that fewer remarriages are expected.

Further, we can define the expected match qualities conditional on marrying each type as:

\[
\begin{align*}
\beta^E &= E(\theta | \theta \geq -Y^E_2) > 0 \\
\beta^U &= E(\theta | \theta \geq -Y^U_2) > 0
\end{align*}
\]

Let \(m\) represent the probability of meeting another unattached person and \(\pi\) represent the probability of being high income within the unattached pool. Note that \(m\) and \(\pi\) are determined in equilibrium and are not set exogenously. The expected utility of a divorced person with employment status \(j\) at the beginning of the second period is then:

\[
V^j_2 = m \ast \left[ \pi \gamma^E(Y^j_2 + Y^E_2 + \beta^E) + \pi(1 - \gamma^E)Y^j_2 + (1 - \pi)\gamma^U(Y^j_2 + Y^U_2 + \beta^U) + (1 - \pi)(1 - \gamma^U)Y^j_2 \right] \\
+ (1 - m)Y^j_2 + q^o \\
= \frac{m\pi\gamma^E(Y^j_2 + Y^E_2 + \beta^E) + m(1 - \pi)\gamma^U(Y^j_2 + Y^U_2 + \beta^U) + pY^j_2}{m\pi\gamma^E(Y^j_2 + Y^E_2 + \beta^E) + m(1 - \pi)\gamma^U(Y^j_2 + Y^U_2 + \beta^U) + pY^j_2} + q^o
\]
where \( p \equiv (1 - m(\pi \gamma^E + (1 - \pi)\gamma^U)) \).

Note the simplifying assumption that a person does not gain utility from another person’s children (ie. a never-married person who marries a divorced person will not enjoy \( q^o \)). We will denote the expected utility of an unattached person that was not married in the first period as \( \tilde{V}_2^j \).

### 2.2 Intermediate stage: the divorce decision

If a person had married at the beginning of the first stage, once employment outcomes for the second period are realized for themselves and their spouse, they need to decide whether to divorce. We will assume unilateral divorces - ie. if the partners disagree, it only takes one to file the divorce and we assume there are no direct costs (such as lawyer fees) to entering a divorce. Adding direct costs would simply reduce the likelihood of entering divorce even more than the reduction in utility associated with having children living with separated parents relative to children living with both parents. We assume match quality of an existing marriage will remain the same in the second period (ie. you don’t fall out of love).

Once second stage (own, spouse) employment outcomes are realized, there are four couples to consider - EE, UU, EU, and UE. The individual with employment status \( j \) in each situation will prefer to divorce if the utility value of staying married to the person with employment status \( k \), \( (W_{jk}^2) \) is less than their expected utility of rejoining the marriage market, \( \tilde{V}_2^j \). That is, for each type of couple we will see divorce if

\[
egin{align*}
W_{2}^{EE} &= 2Y_{2}^{E} + \theta + q^* < \tilde{V}_2^{E} \quad (5) \\
W_{2}^{EU} &= Y_{2}^{E} + Y_{2}^{U} + \theta + q^* < \tilde{V}_2^{E} \quad (6) \\
W_{2}^{UE} &= 2Y_{2}^{U} + \theta + q^* < \tilde{V}_2^{U} \quad (7) \\
W_{2}^{UU} &= Y_{2}^{U} + Y_{2}^{E} + \theta + q^* < \tilde{V}_2^{U} \quad (8)
\end{align*}
\]

This defines a critical value of \( \theta_{dk} \) for the divorce decision of a couple with employment status \((jk)\). That is, \( \theta_{jk} \) is the value of \( \theta \) whereby the individual with employment status \( j \) is indifferent between divorce and staying married to a person with employment status \( k \).

We provide a graphical representation of the incentives for divorce in Figure 1.

We note the following:

\[
egin{align*}
\theta_{d}^{EE} &= \theta_{d}^{EU} < \theta_{d}^{EU} \quad (9) \\
\theta_{d}^{EU} &= \theta_{d}^{UU} \quad \text{as } \quad V_{2}^{E} - V_{2}^{U} = Y_{2}^{E} - Y_{2}^{U} \quad (10) \\
\theta_{d}^{U} - \theta_{d}^{EE} &= Y_{2}^{E} - Y_{2}^{U} \quad (11)
\end{align*}
\]
Figure 1: Divorce decisions and higher unemployment Note: Married EE (UU) couples with a match quality less than \( \theta_{d}^{EE} (\theta_{d}^{UU} ) \) will opt for divorce and reenter the marriage market for period 2. With a recession \( (u'_{2} > u_{2}) \), the expected utility associated with re-entering the marriage market \( V_{2}^{j} \) drops, lowering the divorce thresholds to \( \theta_{d}^{EE} \) and \( \theta_{d}^{UU} \). This reduces incentives to divorce. At the same time, a recession implies a smaller portion of couples that are EE and more UU couples, then requiring on average a higher match quality to stay married. This raises the incentives for couples to divorce.
Note that the probability of divorce for the fully employed couple can be written as $Pr(\theta < V_2^E - 2Y_2^E - q^*) = G(V_2^E - 2Y_2^E - q^*)$.

First, consider ‘mixed’ couples (EU and UE). Our assumption that all goods are public implies the same utility to both spouses for staying married. Since $V_2^E > V_2^U$, and assuming unilateral divorce is possible, the employed person within a mixed couple will determine whether a divorce occurs.

Second, it is the case that all individuals are more likely to choose divorce if their spouse drew a low income rather than a high income. (That is, more UU couples would divorce than UE couples because $G(V_2^U - 2Y_2^U - q^*) > G(V_2^U - Y_2^U - Y_2^E - q^*)$. Similarly, more EU couples would divorce than EE couples.

The EE couples are also less likely to divorce than UU couples.

We note that the existence of children in a marriage reduces the likelihood of divorce, as the loss in utility from children ($q^* - q^o$) represents the major cost of divorce.

### 2.2.1 Effect of the business cycle on divorce rates

We can see at this stage that the business cycle will have two competing effects on the divorce decision. Suppose we entered a recession, so that it is more likely individuals are unemployed in the second period. On one hand, this would result in more couples with at least one member unemployed and lead to a higher divorce rate in equilibrium as the gains from staying married, on average, will be lower. On the other hand, the pool of divorcees is also containing more unemployed persons than before, reducing the value of $V_2^U$ and discouraging divorce. These offsetting effects are depicted in Figure 1.

We note that the overall effect on divorce rates will depend in part on whether the increase in unemployment was caused by an increase in the separation rate or a decrease in the job finding rate. For example, consider the couples that were fully employed in the first period. On one hand, if there is no change in $s$ but a decrease in $f$, their chances of remaining a fully employed couple have not changed with the recession - so the fully employed couples’ utility of staying married is unlikely to change, only the quality of the unattached pool is reduced should they opt for divorce - emphasizing the negative effects of recession on divorce. Second, if $s$ decreases and there is no change in $f$, the chance of remaining a fully employed couple have decreased with the recession - both the gains to staying married and the quality of the unattached pool are worsened. Increased separations will do more to break up marriages among fully employed couples than reductions in job finding rates.

A similar logic holds for couples that were both unemployed in the first period. A lower job finding rate - making the couple more likely to remain unemployed in the second period and reducing the quality of the unattached pool - will do more to break up marriages among unemployed couples than an increase in the separation rate that only reduces the quality of the unattached pool.

Since the countries we are interested in analyzing have high employment rates, we might
expect recessions driven by increases in separation rates to result in more divorces than recessions driven by reductions in the job finding rate\footnote{As the comparative statics of our model are not straightforward, we conducted several numerical simulations to evaluate how changes \( s \) and \( f \) matter for divorce rates. The simulations suggest it is the case that increases in separation rates will have a larger negative effect on divorce than reductions in job finding rates that imply the same overall change in second period unemployment.}

As the difference between \( V_2^E \) and \( V_2^U \) is simply \( Y_2^E - Y_2^U \), it is also clear in Figure\footnote{This point was also confirmed with our simulations.} that a larger gap between employment and unemployment incomes implies even more divorces will occur when recessions occur, as (on average) a higher match quality will be required for marriages to survive\footnote{As the comparative statics of our model are not straightforward, we conducted several numerical simulations to evaluate how changes \( s \) and \( f \) matter for divorce rates. The simulations suggest it is the case that increases in separation rates will have a larger negative effect on divorce than reductions in job finding rates that imply the same overall change in second period unemployment.}

### 2.3 First stage: the marriage decision

At the beginning of the first period, individuals know their employment status \( j \) and meet an individual with employment status \( k \) with potential match quality \( \theta \). Those employed will have a income \( Y_1^E \) and those unemployed with have \( Y_1^U \). Reflecting the assumption that the likelihood of being employed or unemployed in the second period depends on first period employment outcomes, the expected lifetime utility of individuals with employment status \( j \) conditional on their choice to marry someone with employment status \( k \) individuals \((W_{1jk}^k(\theta))\) is:

\[
W_{1jk}^k(\theta) = Y_1^j + Y_1^k + \theta - c + \lambda_{EE}\psi_{EE} + \lambda_{UU}\psi_{UU} + \lambda_{EU}\psi_{EU} + \lambda_{UE}\psi_{UE} 
\]

where

\[
\psi_{EE} = \max(2Y_2^E + \theta + q^*, V_2^E) \tag{13}
\]
\[
\psi_{UU} = \max(2Y_2^U + \theta + q^*, V_2^U) \tag{14}
\]
\[
\psi_{EU} = \max(Y_2^E + Y_2^U + \theta + q^*, V_2^E) \tag{15}
\]
\[
\psi_{UE} = (1 - \delta)(Y_2^E + Y_2^U + \theta + q^*) + \delta V_2^U \tag{16}
\]

where \( \delta = 1[V_2^E > Y_2^E + Y_2^U + \theta + q^*] \) is an indicator variable describing whether a second period employed person within a mixed couple will opt for divorce and \( \lambda \) represents the transition probabilities from one employment status to another. More specifically, we have

\[
W_{1EE}^E(\theta) = Y_1^E + Y_1^E + \theta - c + (1 - s)^2\psi_{EE} + s^2\psi_{UU} + (1 - s)s\psi_{EU} + s(1 - s)\psi_{UE} \tag{17}
\]
\[
W_{1EU}^E(\theta) = Y_1^E + Y_1^U + \theta - c + (1 - s)f\psi_{EE} + s(1 - f)\psi_{UU} + (1 - s)(1 - f)\psi_{EU} + sf\psi_{UE} \tag{18}
\]
\[
W_{1UE}^U(\theta) = Y_1^U + Y_1^E + \theta - c + f(1 - s)\psi_{EE} + (1 - f)s\psi_{UU} + fs\psi_{EU} + (1 - f)(1 - s)\psi_{UE} \tag{19}
\]
\[ W_{1}^{UU}(\theta) = Y_1^U + Y_1^U + \theta - c \]
\[ + f^2 \psi_{EE} + (1 - f)^2 \psi_{UU} + f(1 - f)\psi_{EU} + (1 - f)f\psi_{UE} \]  
(20)

Note that \( W_{1}^{jk}(\theta) \) is increasing in \( \theta \), and the slope is not constant. In the following equations, recall the values for \( \theta_d^{jk} \) were defined in the previous subsection where \( (jk) \) refer to the second period outcomes that the couple will observe at the end of period 1.

\[
\frac{\partial W_{1}^{jk}(\theta)}{\partial \theta} \bigg|_{\theta < \theta_d^{EE}} = 1 \]  
(22)

\[
\frac{\partial W_{1}^{jk}(\theta)}{\partial \theta} \bigg|_{\theta > \theta_d^{UU}} = 2 \]  
(23)

and interior portions of the function’s slope will depend on the value of \( s \) and \( f \). On this portion of the function, only the couples that remain fully employed in the second period will choose continued marriage over divorce. Although the person that is unemployed in the second period would desire continued marriage with an employed person, the employed person would reject the unemployed person’s proposal for continued marriage. As such, we have the following:

\[
\frac{\partial W_{1}^{EE}(\theta)}{\partial \theta} \bigg|_{\theta \geq \theta_d^{EE}, \theta \leq \theta_d^{UU}} = 1 + (1 - s)^2 \]  
(24)

\[
\frac{\partial W_{1}^{EU}(\theta)}{\partial \theta} \bigg|_{\theta \geq \theta_d^{EE}, \theta \leq \theta_d^{UU}} = 1 + (1 - s)f \]  
(25)

\[
\frac{\partial W_{1}^{UE}(\theta)}{\partial \theta} \bigg|_{\theta \geq \theta_d^{EE}, \theta \leq \theta_d^{UU}} = 1 + f(1 - s) \]  
(26)

\[
\frac{\partial W_{1}^{UU}(\theta)}{\partial \theta} \bigg|_{\theta \geq \theta_d^{EE}, \theta \leq \theta_d^{UU}} = 1 + f^2 \]  
(27)

Given their employment outcome for the first period, the individual’s expected utility of choosing to be single in the first period (thereby forgoing children) and trying the marriage market again next period is:

\[ V_1^E = Y_1^E + (1 - s)\tilde{V}_2^E + s\tilde{V}_2^U \]  
(28)

\[ V_1^U = Y_1^U + f\tilde{V}_2^E + (1 - f)\tilde{V}_2^U \]  
(29)
or to state this more generally we have

\[ V_j^1 = Y_j^1 + \lambda_E \tilde{V}_2^E + \lambda_U \tilde{V}_2^U \]  

(30)

Recall \( \tilde{V}_2^j \) is the same as in equation (4) except the individual does not enjoy the second period utility associated with having a child (\( q^o \)).

The person will choose to enter the marriage in the first period if \( W_{jk}^1(\theta) \geq V_j^1 \). This implies the match quality \( \theta_{jk}^m \), below which individuals will choose not to get married in the first period (as in Figure 2).

\[ W \]

\[ \theta_{EE}^m \quad \theta_{UU}^m \]

\[ \theta_{EE} \quad \theta_{EU} \quad \theta_{UU} \]

\[ V_j^E \quad V_j^U \]

Figure 2: Expected utility of marriage given income and potential match quality at the beginning of first period. Note: for a given match quality \( \theta \), matches with quality \( \theta > \theta_{jk}^m \) will choose to get married while others remain single and forego having children.

### 2.3.1 Relative values of \( \theta_{jk}^m \)

When thinking about the relative values of the match quality required for each couple to marry in the first period, it is useful to note the following relationships:
\[ V_1^E - V_1^U = (Y_1^E - Y_1^U) + (1 - s - f)(Y_2^E - Y_2^U) \] (31)

\[ (W_1^{EE} - W_1^{UU})|_{\theta < \theta_d^{EE}} = 2(Y_1^E - Y_1^U) + (1 - s - f)(Y_2^E - Y_2^U) \] (32)

\[ (W_1^{EE} - W_1^{EU})|_{\theta < \theta_d^{EE}} = (Y_1^E - Y_1^U) \] (33)

\[ (W_1^{UE} - W_1^{UU})|_{\theta < \theta_d^{EE}} = (Y_1^E - Y_1^U) \] (34)

\[ (W_1^{EE} - W_1^{UU})|_{\theta > \theta_d^{EE}} = 2(Y_1^E - Y_1^U) + 2(1 - s - f)(Y_2^E - Y_2^U) \] (35)

\[ (W_1^{EE} - W_1^{EU})|_{\theta > \theta_d^{EE}} = (Y_1^E - Y_1^U) + (1 - s - f)(Y_2^E - Y_2^U) \] (36)

\[ (W_1^{UE} - W_1^{UU})|_{\theta > \theta_d^{EE}} = (Y_1^E - Y_1^U) \] (37)

\[ (W_1^{EU} - W_1^{UE})|_{\theta < \theta_d^{EE}} = (1 - s - f)(Y_2^E - Y_2^U) \] (38)

\[ (W_1^{EU} - W_1^{UE})|_{\theta > \theta_d^{EE}} = 0 \] (39)

With the assumption that \((1 - s - f) > 0\) and \(f > s\) (which will generally match what is observed in the data), we can say the following:

- The gap \(W_1^{EE} - W_1^{UU}\) is up to twice as large as the gap \(V_1^E - V_1^U\). The fully employed couples will accept a lower match quality for marriage than the fully unemployed couples.

- \(W_1^{EE}\) always lies above \(W_1^{EU}\). The fully employed couples will accept a lower match quality for marriage than the mixed employment couple.

- The gap \((W_1^{EU} - W_1^{UE})|_{\theta < \theta_d^{EE}}\) is positive or zero. This implies the unemployed person in a mixed match is willing to accept a lower match quality for marriage than the employed person. Since the individuals must agree about marriage, only the critical value based on the employed person is relevant. The desires of the unemployed individual in an mixed couple are not irrelevant.

### 2.3.2 First period and second period marriages

We expect there to be important differences between first and second marriages in terms of how selective individuals are regarding match quality. This requires taking a closer look at the value of \(\theta_{jk}^{m1}\). For our purposes in this subsection, we will denote the match quality required to form a marriage in the first period as \(\theta_{jk}^{m1}\) and the match quality required to form a marriage in the second period as \(\theta_{jk}^{m2}\).

The decision for a second period marriage is relatively simple. A person (employed or unemployed) will marry an individual with employment status \(k\) as long as

\[ \theta_{jk}^{m2} \geq -Y_2^k. \] (40)
This represents a simple tradeoff between the income that a person brings to a marriage and the potential match quality.

The decision for a first period marriage is more complex. The value of $\theta_{m1}^{jk}$ depends on where $V_{1}^{j}$ intersects with $W_{1}^{jk}$.

In the first case (with a very low $V_{1}^{j}$), couples would be indifferent between remaining single and marriage followed by certain divorce. In this case, we have

$$\theta_{m1}^{jk} = -Y_{1}^{k} + c \left[ \lambda_{EE} V_{2}^{E} + \lambda_{UU} V_{2}^{U} + \lambda_{UE} V_{2}^{E} + \lambda_{UE} V_{2}^{U} \right] + \lambda_{E} V_{2}^{E} + \lambda_{U} V_{2}^{U}$$

$$(41)$$

$$= -Y_{1}^{k} + c - q^{0}$$

$$(42)$$

In the second case (with a very high $V_{1}^{j}$), couples would be indifferent between remaining single and a marriage that remains intact with certainty. In this case, we have

$$\theta_{m1}^{jk} = -Y_{1}^{k} + c \left[ \lambda_{EE} (2Y_{2}^{E} + \theta_{m1}^{jk} + q^{*}) + \lambda_{EU} (2Y_{2}^{U} + \theta_{m1}^{jk} + q^{*}) \right] + \lambda_{E} V_{2}^{E} + \lambda_{U} V_{2}^{U}$$

$$(43)$$

$$\Rightarrow \theta_{m1}^{jk} = \frac{1}{2} \left( -Y_{1}^{k} + c - q^{*} \right) - (2\lambda_{EE} + \lambda_{EU} + \lambda_{UE}) Y_{2}^{E} - (2\lambda_{UU} + \lambda_{EU} + \lambda_{UE}) Y_{2}^{U} + \lambda_{E} V_{2}^{E} + \lambda_{U} V_{2}^{U} \right)$$

$$(44)$$

In the third case (the intermediate case for $V_{1}^{j}$), couples would be indifferent between remaining single and a marriage that dissolves if either spouse is unemployed in the second period. In this case, we have

$$\theta_{m1}^{jk} = -Y_{1}^{k} + c \left[ \lambda_{EE} (2Y_{2}^{E} + \theta_{m1}^{jk} + q^{*}) + \lambda_{UU} V_{2}^{U} + \lambda_{UE} V_{2}^{E} + \lambda_{UE} V_{2}^{U} \right]$$

$$(45)$$

$$\Rightarrow \theta_{m1}^{jk} = \frac{1}{1 + \lambda_{EE}} \left( -Y_{1}^{k} + c - \lambda_{EE} (2Y_{2}^{E} + q^{*}) - (\lambda_{U} + \lambda_{EU}) q^{0} + \lambda_{EE} V_{2}^{E} \right)$$

$$(46)$$

The possible values of $\theta_{m1}^{jk}$ and $\theta_{m2}^{jk}$ suggest there are several factors influencing whether first or second marriage formation tends to require a higher match quality.

- Second marriages will tend to accept lower quality matches if there is life-cycle growth in wages ($Y_{2}^{k} > Y_{1}^{k}$).
- First marriages will tend to require higher quality matches when child production costs are higher.
- First marriages will tend to accept lower quality matches when second period utility from children is higher.
• First marriages will tend to require higher quality matches when the value of holding the option to search for a new match in the second period is higher. That is, having the option to search later makes individuals more selective in their first marriage decision. This only applies in the case that we expect at least some marriages to survive more than one period.

2.3.3 Effect of the business cycle on first and second marriage rates

An increase in the unemployment rate in either period has a direct effect on first or second marriage formation by reducing the likelihood that individuals are matched with an employed individual. In both cases, marriage formation will on average require a higher match quality. As such, we can expect to see fewer first or second marriages formed during a recession.

With first marriages, however, there may be a secondary effect that offsets this negative effect of higher unemployment on marriage. Given there is some persistence in unemployment rates, an increase in the unemployment rate early in life will also imply a lower average income among those in the unattached pool later in life. This worsens the prospects for later marriage (ie. lowering $\tilde{V}_2^E$ and $\tilde{V}_2^U$). As the value of holding the option to search for spouse later in life falls, individuals may become less selective about match quality in the first period so that the recession actually makes them more likely to marry with respect to this dimension of the decision. As such, we might expect first marriages to be less sensitive to business cycle fluctuations than second marriages.

At the same time, however, a higher unemployment rate in the first period implies fewer marriages formed in the first period and more individuals in the unattached pool for the second period. This search externality is amplified when a recession occurs in the first period, which could make first marriages more sensitive to business cycle fluctuations than second marriages.

Unfortunately, the comparative statics of this model are not straightforward, making the net effect of recessions on first marriages difficult to pin down. Similar to our discussion of divorce rates over the business cycle, we suspect that the net effect of changes in $u_1$ on the value of holding the option to search in the second period will depend on the amount of churning in the labour market (ie. values of $s$ and $f$).

We conducted several numerical simulations of the model to investigate this further. In a less mobile economy (lower $f$ and $s$), first marriage rates appear more responsive to an increase in the unemployment rate. Intuitively, when there is a great deal of churning in the labour market, people are already expecting the employment status of themselves, their spouses, and their potential future spouses to change in the future and the anticipation of this is factored into the first marriage decision. A small change in first period unemployment then will have relatively little effect. (Further, with a high $f$, an unemployed person today has a good chance of being employed next period.) In contrast, when there is isn’t much churning in the labour market, people typically anticipate holding the same job or continuing in unemployment through to the next period. A small change in unemployment rates might then play a larger role in defining their future expectations regarding search in the marriage
market. As such, a small increase in unemployment rates may have a larger negative effect on marriages.

To summarize, we expect that first marriages will be more responsive to the business cycle (falling during recessions) in cases where there is less churning in the labour market (lower s and f). We expect first marriage to be less responsive to the business cycle in cases where there is more churning in the labour market.

We think the interactions between the nature of unemployment (as it relates to mobility within the labour market) is an interesting result that comes out of this model. Further research is warranted to help us better understand how these mechanisms work during a recession.

3 Model extensions

It is worth noting a few of the obvious model extensions that we have not presented here.

3.1 Over-lapping generations

To keep things simple, we are only considering the decisions of one birth cohort at this time. A richer model could be extended as an over-lapping generations model that allowed new cohorts to be born each period, but restricted marriages to only occur within a cohort, without changing the key predictions we consider. A richer over-lapping generations model would allow us to consider how changes to business conditions affect broader aggregates such as the proportion of all individuals (young and old) married at one point in time. The single-cohort model restricts us to a discussion of decisions within each period, taking the cohort’s past decisions as given.

3.2 Large number of periods

Modelling only two periods of a person’s life does not allow for slight delays in a first marriage, which has been shown to matter empirically (see Kondo 2012). We can envision a model allowing for a large number of periods, with some cut-off point for fertility and some restrictions to marry within-cohort. We expect key predictions to remain the same with respect to the business cycle. At any point in time a recession will reduce the portion of the population entering a first marriage. Those who are married and considering divorce will still face the trade-off between the recession’s effects on the gains from their existing marriage and on the quality of the pool of unattached individuals. The major difference with such a model would be with total fertility.
3.3 Endogenous fertility decisions

The fertility decision is easily endogenized by allowing those who choose marriage in the first period to also choose whether to have children. This will complicate the decision represented by Figure 2, such that an EE couple (for example), will have two paths to consider - marriage with children and marriage without children. In equilibrium, there may be some couples who choose to marry without having children as long as costs of children are positive. If costs of children are too high, we could see all married couples choose not to have children. Adding this dimension to the model makes it more difficult to solve, but as long as the costs of children are such that most married couples have kids then the key predictions of the model are unchanged. When there are some couples without children, there are on average smaller gains to staying married in the second period relative to a scenario where everyone has kids, so that we may see more divorces occur in equilibrium. When thinking about the effects of a recession, the key arguments for divorce are the same as those depicted in Figure 1, except that the utility of children would not be included in the functions for those who chose to remain childless. The effects of a recession on the quality of the unattached pool are the same whether or not a person has children. In a model with a large number of periods, endogenizing the fertility decision would allow for a richer discussion of delayed fertility (rather than a change in total fertility) that could result in a recession.

4 References


