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Title: Migration and Marriage: Modeling the Joint Process

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Abstract

The current study investigates relationships between migration and marriage in the United States by using data from the National Longitudinal Survey of Youth 1979. In previous literature estimating the relationships, little attention has been given to dependency between the two events. However, migration and marriage are closely related to each other and unobserved factors may affect the likelihood of migration and marriage simultaneously. We estimate the two events simultaneously with a correlation between residuals which accounts for possible endogeneity between the two. In addition, since most people experience both events multiple times throughout the lifetime, we allow random effects of each event in the models. The findings suggest that models capturing event dependency produce coefficients different from those from models without endogeneity, which indicates significant interrelationships between migration and marriage.

Keywords
Migration, marriage, a multi-process model, NLSY79

Introduction

Migration decisions are made with decisions about other life course events (Schachter 2001; Mulder and Wagner 1993). People leave parental home and settle in a new place for educational and occupational careers and some start a family with partners in a new residence (Garasky et al. 2001; Goldscheider and Goldscheider 1994). An increase or a decrease in family size through childbirth or union dissolution also coincides with changes in residence due to substantial needs of adjusting spaces (Flowerdew and Al-Hamad 2004; Kulu and Milewski 2007). Despite the close relationships, most studies on migration have simplified the role of migration, assuming an independent and parallel relationship with other life course events by including migration as an explanatory variable that either promotes or delays union formation (Goldscheider and Waite 1987; Guzzo 2006). However, we suspect that the migration process may be more complicated and dependent on other life course events, and then, ignoring the dependency may yield biased estimates of these relationships (Boyle et al. 2008; Kulu and Milewski 2007; Steele et al. 2005).

To the extent that migration is a planful behavior (Cadwallader 1992; Clausen 1991; Massey et al. 1993), people expect better outcomes through migration such as higher incomes and educational attainment (Mills and Hazarika 2001). The improved personal resources may increase the likelihood of union formation because individual economic status plays a significant role in union formation behaviors (Carlson et al. 2004; Oppenheimer 2003) and increase individual's marriage market prospects (Stark 1988). On the other hand, moving can also delay union formation because people need time to adjust to new environments (Jampaklay 2006). In studies on relationships between migration and fertility, for instance, the fertility levels of recent migrants are often considerably low although it eventually catches up to corresponding levels

later (Goldstein 1973; Goldstein and Goldstein 1982). Similar to the fertility, marital behaviors are probably disrupted by the migration process within a short interval unless the movers change residence with their partners. Adding to the two competing views, if a causal association between marriage and migration exists, it is not certain whether migration causes marriage or vice versa and whether migrants are among the selective groups of people who are prone to marry (or vice versa) (Kulu and Milewski 2007; Mulder and Wagner 1993). To date, no study has addressed the possible connection and this gap highlights the need for a careful study examining the relationships between migration and marriage in the United States and possible endogeneity to clarify the contrasting empirical evidence and establish a concrete theoretical framework.

The current study, therefore, investigates the experiences of migration and marriage in the U.S. using panel data from the National Longitudinal Survey of Youth 1979 (NLSY79). Since individuals are expected to experience the two events several times over the life course, we model a series of events by employing a multi-level model which allows personal propensity to migrate or marry (Steele et al. 2006). Moreover, to explain possible correlations between migration and marriage which may affect the occurrence of both events, we estimate the two life course events simultaneously by utilizing a multi-process model introduced by Lillard and Waite (1993).

Migration and Marriage

Moving patterns vary by life course stages in part because changes in family size require spatial adjustment (McAuley and Nutty 1982; Michielin and Mulder 2007). The larger the number of family members (e.g., by union formation or childbirth), the less migration occurs due to the increased cost of a move and the number of social ties broken as a result of the move

(Long 1973). Prior studies also recognize family-building behaviors as a major cause of migration, and suggested migration is closely related to marriage (Guzzo, 2006; Speare and Goldscheider 1987). For example, marriage increases the likelihood of migration as newlyweds settle in new places or at least one partner moves in (Speare and Goldscheider 1987). This positive relationship persists in both first-marriages and remarriages and lasts for several years (Speare and Goldscheider 1987), although this study used a geographically restricted sample in the United States so these findings need to be replicated using a national sample.

The timing and types of migration have influenced union formation in two contradictory ways (Guzzo 2006; Jampaklay 2006). First, migration encourages marriage because of better economic conditions that the movers will experience after migration (Massey et al. 1993). For example, migrants from nonmetropolitan counties end in higher educational attainment and earnings after migrating to a metropolitan county (Mills and Hazarika 2001), which would improve their marriage market eligibility. The improved resources also compound existing preferences for marriage among nonmetropolitan populations (Snyder 2012), which should increase the odds of marriage (Oppenheimer 2003). While these studies highlight personal readiness for marriage, other marriage market research demonstrates that the local supply of marriageable mates influences individual's decision to marry by providing a pool of potential mates (Lichter et al. 1992; Lichter et al. 1995; Oppenheimer 1988; South and Lloyd 1992). If the marriage markets fail to provide favorable conditions matched to mate seeker's criteria, people attempt to compensate the failure by adjusting the criteria and in effect cast a wider net (Lichter et al. 1992), which can increase the chance for finding a partner (Qian et al. 2005). For example, the marriageability of unwed mothers is probably low unless they marry the fathers of their children, and thus, they tend to marry to those with dissimilar characteristics such as less

educated or older (Qian et al. 2005). These studies, however, assume that individuals stay in the same marriage market, which rules out the possibility of moving to a better marriage market. As an alternative strategy to casting a wider net in one's current marriage market, individuals may consider moving to new places where more martial partners with assortative socioeconomic characteristics are available similar to job seekers who move from low to high wage places for maximizing gains (Massey et al. 1993). Then, migration behavior can also be viewed as an investment behavior that widens the mate selection process. If mover's likelihood of marriage increases, this supports the idea of migration as a strategy for expanding marital opportunities.

It is also, however, necessary to consider how migration delays marriage because it takes time to adjust to new environments (Jampaklay 2006). Unless people move with partners, it may be difficult to meet and court potential partners in new places. Thus, it is reasonable to expect that the probability of marriage decreases in the same year of a migration event, although the odds of marriage perhaps increase as the length of residence increases. Moreover, characteristics of the move are important to take into consideration. Goldscheider and Waite (1987) find that the first migration - leaving from parental home - decreases the probability of subsequent marriage among women, mostly because independent living arrangement in new places alter young women's attitudes and values toward traditional family roles. Supporting this idea is the behavioral perspective of migration that emphasizes the importance of subjective perception of environments (Cadwallader 1992), and suggests that the likelihood of union formation is greater for stayers than movers because the origin place provides a pool of potential partners with similar values and backgrounds. These hypotheses have rarely been investigated with empirical data at an individual level, and we will do so using recent data from the National Longitudinal Survey of Youth 1979.

Correlated Processes between Marriage and Migration

Research on migration has disproportionately focused on the first move although most people migrate several times throughout the life course (DaVanzo 1983). The initial move is, however, less likely to satisfy movers' needs because they may have had little information about new environments and be disappointed by the discrepancy between their expected and actual gains (McHugh et al. 1995). As a result, some of the initial movers seek additional destinations while others return to the original places (McHugh et al. 1995; Wilson et al. 2009). The sequential migration patterns vary by location-specific capital and length residing in the place (DaVanzo and Morrison 1981) and also by personal traits which are not captured with explanatory variables typically available in estimation (DaVanzo 1983; Gabriel and Schmitz 1993). Similarly, individuals are exposed to multiple transitions in union formation over their lifetime (Cherlin 2010), and it is largely attributed to differences in socioeconomic status, race/ethnicity but also personal values and tendency (Smith 2005; Thornton and Young-DeMarco 2001). The personal traits, unobserved in estimation, affect marital choices and differentiate those who are involved in a series of marriages from those who are not. The unobserved components can be explained by allowing for a correlation of the duration between events (i.e., marriage and migration) within the same individual.

In addition, unobserved components probably play a significant role in other life course transitions (Kulu and Milewski 2007; Mulder and Wagner 1993). For example, Mulder and Wagner (1993) investigate a synchronized relationship between migration and marriage by using data from West Germany and suggest co-occurrence of the two events which had been largely ignored in the prior literature. Their findings reveal that estimates from a model allowing for synchronized relationships between migration and marriage differ from those from a model

without the relationships. For example, women, before ages 25, are more likely than males to move short distance in the model without a synchronized effect of marriage. However, once the correlated relationships are controlled, sex differences in short-distance moves disappear and age-specific moving patterns become less pronounced (Mulder and Wagner 1993). In other words, the sex differences in mobility are completely attributed to synchronization effects of marriage. Nevertheless, few studies to date have included disturbance between multiple events and personal propensity when investigating life course transitions despite their significant effects on estimates as Mulder and Wagner (1993) suggested.

Simultaneous relationships between migration and marriage can be estimated using a multi-process model that was proposed by Lillard and Waite (1993). The model jointly estimates more than two simultaneous equations while allowing for unobserved factors that are not included in the model but affect both migration and marriage processes. Since individuals expect to experience both life course events – migration and marriage – several times over the lifetime, each process also contains unmeasured factors affecting the propensity of the event occurrence. To account for the unobserved factors, we employ a form of a multi-level approach that explains personal traits which are constant across events (Rabe-Hesketh and Skrondal 2012; Steele et al. 2006).

Research Questions

This study addresses the following research questions:

1) Does marriage affect the likelihood of migration?

People consider migration during transition periods of their life course (Clausen 1991). Because marriage is one of the major life course events that typically require new spaces, we expect that marriage increases the likelihood of migration. Moreover, because a certain group of people migrate more often than others, such as those socioeconomically disadvantaged (DaVanzo 1983) or having unmeasured tendency, we hypothesize that personal propensity plays a significant role in determining migration.

2) Does migration affect the likelihood of marriage?

Reflecting on the idea that migration is an investment behavior (Molloy et al. 2011; Massey et al. 1993), we propose two competing hypotheses. We first hypothesize that migration increases the likelihood of marriage. That is, migration may expand movers' opportunities for marriage due to improved resources or better marriage markets after migration. It is also possible that those dating with partners solidify their relationship when they consider migration. On the other hand, great mental and physical stress are often accompanied by moving events as movers are exposed to new environments which require numerous changes in their lives such as daily routine, social networks, and identity (Magdol 2002; McCollum 1990). Due to the high levels of stress, movers perhaps forgo dating for a while, which decreases the chance to marry. In addition, individuals probably take some time to marry after migration, similar to the disruption effect of migration on fertility (Kulu 2005). Finally, it is also hypothesized that unobserved factors representing individual preferences significantly affect the estimations of various factors on marriage.

3) Do migration and marriage take place simultaneously?

The decision on migration is closely related to a marital decision. If decisions about marriage and migration are jointly made, unmeasured components could affect the estimation of each process, which may yield biased results that either inflate or deflate coefficient values unless accounted for (Brien et al. 1999; Lillard and Waite 1993; Steele et al. 2005; Steele 2005). To examine this possibility, we jointly model the processes and hypothesize that significant correlations exist in the equations, indicating the two processes are related to each other (Steele et al. 2005; 2006).

Data and Measurements

This study uses public and geocode data from the National Longitudinal Survey of Youth 1979 (NLSY79), which has interviewed 12,686 individuals from 1979, when they were ages 14 to 21, until their late 40s and early 50s in 2010. The analyses include longitudinal information of 9,763 respondents, omitting a military sample of 1,280 individuals having unusual moving patterns and a subsample of 1,643 economically disadvantaged non-black and non-Hispanic individuals who have not been interviewed since 1990. The NLSY provides a large amount of information on family formation, education and employment in public files and details about residence in the geocode files which allow us to create various life course histories. For marriage, we draw information from partner-specific characteristics files including the number of partners and relationship status (i.e., spouse, partner, or single) every survey year (Center for Human Resources 2011). To create a marital history before the first interview, we also use the actual starting and ending dates of marriages in public files. About 83% of the respondents first marry around age 25 and about one fifth marry again. On average, the first marriage lasts for 8.5 years (see Table 2). Unlike marital information, the exact dates of migration are not available in the NLSY. We, therefore, use the county and state FIPS codes and define a migration event as

changes in county of residence between survey years. Since the FIPS codes are only available yearly, the migration history captures moving experiences between years, which may underestimate actual moving incidents such as changes in residence in a short period. Moreover, the relationships between migration and marriage in the same year may be problematic with the measure because we are not certain about which incident occurs first and then another follows. In other words, it may be possible that marriage after migration is treated as the same with the marriage before migration in our model if the two cases occur in the same year. Although it probably threatens validity of measuring relationships between the two events, we believe that it is the best way to present migration experiences with the given information. About 70% of the sample has once moved out from their original county of residence in 1979 around age 26 (see Table 1) and stayed there for about 4 years. Since the analyses take an event history approach, data are transformed into person-year files which generate 142,306 person-years. To estimate two equations simultaneously, we restricted the sample to those who were age 16 at the first interview which is the onset of risks of both migration and marriage. The final dataset includes 7,945 individuals who provide 93,348 person years for analysis.

Table 1 displays explanatory variables included in the analyses. They are individual, household, and county characteristics which have been pointed to determinants for the occurrence of each event. As distinct developmental tasks are required at each stage of life course (McAuley and Nutty 1982; 1985), age effects are controlled in the models with square and cubical forms. Studies on life course events report mixed findings about gender differences in life experiences. It is evident that females marry earlier than males (Kreider and Ellis 2011), yet gender differences in migration have varied by studies. Males are in general more likely than females to migrate since historically men invest more in human capital (Quinn and Rubb 2011).

On the other hand, young female adults leave their parental home earlier than their male counterparts (Buck and Scott 1993; Garasky 2002) and unmarried females move significantly more than their male counterparts, especially in the case of long distance moves (Mulder and Wagner 1993). This is partly because a higher proportion of men are involved in postsecondary education and females marry earlier (De Jong, 2010; Long 1973). To sort this out, we will test the effects of gender on marriage and migration in this study. Race and ethnicity also influence the timing of marriage and migration (Glick et al. 2006). Whites are more likely to delay marriage until fulfilling their career goals but eventually more whites are married compared to non-Hispanic Blacks and Hispanics (Goldstein and Kenney 2001). Studies on racial differences in moving patterns also suggest that the moving rates vary by the characteristics of places such as racial distribution (Crowder 2000) and wage differentials (Wolaver and White 2006). In addition, individual socioeconomic statuses have represented their capability to manage life course transitions (Oppenheimer 1988). For example, those completing education and being employed full-time are more likely to marry but less likely to move although those who are in school and unemployed tend to show unstable life course transitions such as frequent moves for job search (DaVanzo 1983). To the extent that economic characteristics affect life course decisions, we also include local economic conditions as control variables, assuming that individuals in places with worse economic conditions are more likely to move (Massey et al. 1993). Adding to the economic factors, the sex ratio significantly influences marriage rates and timing (South and Lloyd 1992), and is thus included in the models estimating marriage timing. The sex ratio is measured by percentage of female population in the county of residence. With regard to migration, previous research using aggregated data shows that places with less promising local economic conditions have suffered from population loss, reflecting the relationships between

local socioeconomic conditions and individual's migration decisions (Massey et al. 1993). Local socioeconomic conditions at the first interview- such as median family income, poverty rates, unemployment rates, and measures of educational attainment of local population - are included in our models. Other than economic features, individuals may take into consideration local amenities and access to facilities as critical factors to determining migration (Cadwallader 1992; McAuley and Nutty 1982). To account for this, we include the local crime rate as a possible factor affecting migration decisions.

Household characteristics are also significant factors determining life course decisions. Greater household resources promote independence and autonomy for individuals, resulting in earlier migration and independent living (Avery et al. 1992). In addition, unstable family structure encourages individuals to move frequently and form their own family earlier although the opposite has also received empirical support such that economic and emotional support from a stable family encourages people to be independent (Avery et al. 1992). We will test these relationships in the analyses by including maternal educational attainment and whether respondents have lived in an intact family. Other than those factors, we include an indicator of residence, i.e., nonmetropolitan or metropolitan areas, since there have been significant differences in life course experiences by the residence (Cromartie 1993; Snyder et al. 2004). A yearly time-varying measure of nonmetropolitan and metropolitan residence, that is, 2003 Urban Influence Codes from USDA ERS (United States Department of Agriculture), is included in our models due to changes in standards measuring the metropolitan and nonmetropolitan statistical areas in the NLSY79[1].

[1]For variables of classification in nonmetropolitan and metropolitan areas, the NLSY79 use the 1973 City Reference File (CRF) in 1979 through 1982, the 1982 CRF for 1983 variables, the 1983 CRF for 1984 through 1987, the 1987

Analytical Strategies

The timing of migration and marriage is examined using discrete-time hazard models. The models demonstrate the probability of each event, incorporating various factors related to the event occurrence while at risk. Given that each event takes place multiple times, a random disturbance term that is correlated within the same individuals is added to our models (Allison 1984). The models for each process can be specified as:

$$\log [h^{MIG}(t)] = \alpha_0{}^{MIG}D(t) + \alpha_1{}^{MIG}F(t) + \alpha_2 \text{Marriage}(t) + \alpha_3 X^{MIG} + u^{MIG} \quad (1)$$

$$\log [h^{MAR}(t)] = \alpha_0{}^{MAR}D(t) + \alpha_1{}^{MAR}F(t) + \alpha_2 \text{Migration}(t) + \alpha_3 X^{MAR} + u^{MAR} \quad (2)$$

The equation (1) accounts for the hazard of migration at time t ($\log [h^{MIG}(t)]$); $D(t)$ represents a function of duration to migration from the onset of the risk. Once individuals move, they are at risk of a next move. *F(t)* denotes a time-varying covariate whose values change over time such as educational attainment, employment status, and living in metro areas in this study. Marital status is also included as a time-varying variable, i.e., whether individuals are married or not at time t. To account for the possible time interval, we analyze the relationships between migration and marriage by measuring migration lagged 1 year. The parameter *X* represents time-constant values such as demographic, household, and county characteristics (at the first interview) of respondents. As described, a person-specific residual, u^{MIG}, is included to control for possible correlations across subsequent events for the same person as well as unmeasured features affecting migration (Allison 1984; Boyle et al. 2008; Rabe-Hesketh and Skrondal 2012).

CRF for 1988 through 1992, the 1992 CRF for 1993 through 1998, and a slight different calculation process from 2000 to 2006 (Center for Human Resource Research, NLSY79 Codebook Supplement, Appendix 6 2008). Due to the change, some respondents can appear to move from metro to nonmetro areas though they have not changed their residence.

Similar to the migration process, the equation of marriage (2) specifies a function of duration dependency, time-varying and time-constant covariates. In this model, respondents become at risk of the first marriage when they became 16 years old. Unlike migration, the first marriage does not necessarily lead individuals to being at risk of the second marriage. Rather, they are placed at risk of marital dissolution. Only those who end their first marriage will be at risk for the second marriage. A person specific residual, u^{MAR}, in the equation also controls for any unobserved heterogeneity for the same individual, affecting marriage and being constant across subsequent marriages.

With regard to residual terms, we first assume that migration and marriage are independent each other, indicating there is no endogeneity between the two; the residuals are identically distributed according to a normal distribution:

$$u^{event} \sim N(0, \sigma^2)$$

The first two models may function sufficiently if unobserved aspects from each equation play no role in the other life course event. However, it may be more plausible that migration and marriage are endogenous given that either net of all the measured variables or unmeasured explanatory variables affecting both processes exist in the model. The possible role of endogeneity can be accounted for by estimating the two equations simultaneously and allowing the two disturbances to be correlated (Steele et al. 2005; Upchurch et al. 2002).

$$u = (u^{mig}, u^{marr}) \sim N(0, \sigma^2)$$

Identification

The model jointly estimating correlations between migration and marriage requires an exclusion term for identification (Lillard and Waite 1993). In other words, the model should contain an exclusion of covariates affecting the hazard of one process but not directly impacting another (Brien et al. 1999; Lillard and Waite 1993; Steele et al. 2005; 2006). We posit that demographic characteristics in local marriage markets, such as the sex ratio, can function as an instrument since the local marriage market conditions substantially affect marriage opportunities of mate seekers by providing a pool of assortative mates (Lichter et al. 1991). We include the sex ratio in the county of residence as an instrument term in our models.

Results

Table 2 describes experiences of migration and marriage over survey years (i.e., from 1979 to 2008). About 30% of respondents have never moved from their county of residence in 1979, while 70% migrate at least once. On average the first move takes place in the mid 20s. With regard to marriage, 83% of the respondents marry once during the survey period and about 20% experience the second marriage. Few people are involved in third or higher-order marriages. Mean age at first marriage is about age 25 while the second marriage takes place on average at age 33.

Following the descriptive analyses, we consider two specifications of a random-effect event-history model (i.e., a multilevel event-history model). First, migration and marriage are modeled independently without endogeneity in a single process model, indicating that the unobserved factors only explain variability within either migration or marriage but not between the two events. Second, we estimate a multi-process model that allows a correlation between the person-specific random effects ($u^{mig\ *marr}$ in Table 5). If the correlation appears significant, it

suggests that unobserved components influencing migration also play a role in determining marriage (or vice versa) and that coefficients from the single process model may have resulted in biased estimates that inflate or deflate coefficient values (Steele et al. 2005).

A Correlation between Random Effects

Table 5 presents the estimated random effects from single-process and multi-process models. In the multi-process model, we find a significant positive correlation in residuals between migration and marriage ($u^{mig*marr} = .24$). This indicates that some components not included in the model of migration and marriage make people more likely to move and marry. Thus, the unobserved relationships between migration and marriage affect the estimation of effects of marriage on migration and vice versa. The discrepancy in estimates between the single and multi-process models from Tables 3 and 4 strongly suggests that the models without endogeneity overestimates the effect of migration on marriage and vice versa (Lillard and Waite 1993; Mulder and Wagner 1993;).

Modeling the Timing of Migration

Table 3 presents coefficients from the hazard regression model predicting migration. A single process model specifies the timing of migration with a personal specific residual while assuming the effects of marriage as exogenous. The significant random effect in the single process model for migration in Table 5 (0.12) indicates that the coefficient pertains to significant unobserved factors reflecting the propensity to move. In other words, 12% of the variance in the likelihood of migration is attributed to personal specific characteristics.

In both the single and multi-process models, marriage significantly increases the likelihood of migration although an increase in the number of marriages is negatively related to migration. The positive relationship between migration and marriage provides evidence suggesting that newlyweds establish households in a new place. Even without endogeneity, marriage is a significant determinant of migration although the size of coefficients significantly decreases by more than the half (0.45 and 0.20 in the single-process and multi-process models, respectively). This indicates that couples are more likely to move to find a suitable residence during the first year of marriage. On the other hand, the probability of migrating decreases as total number of marriage increases. This could be because the number and intensity of social networks and local ties increase once people get married. Longer marriages presumably form more social ties that can be broken with migration, which may explain why higher order marriages are negatively related to migration decisions. In addition, it may reflect that those involved in sequential union formation represent a socioeconomically disadvantaged population (Lichter and Qian 2008) with fewer resources to change residence.

The effects of other variables on the timing of migration change once unobserved heterogeneity is explained in a multi-process model. Females are significantly less likely than males to migrate and the marginal significance becomes stronger in the multi-process model, suggesting a greater propensity for migration due to marriage among women and women's lower tendency to invest in human capital (Quinn and Rubb 2011; Shauman and Noonan 2007). Non-Hispanic Blacks and Hispanics are less likely than their non-Hispanic white counterparts to move and the racial differences persist significant after controlling for individual heterogeneity.

Greater personal and household socioeconomic resources increase the likelihood of migration in both the single-process and multi-process models. Those completing high school or

college and being employed part-time are more likely than those with less than high school diploma and full-time employees, respectively, to move, reflecting migration as a job search strategy. The effects of household characteristics become weaker once the simultaneous relationship between migration and marriage is controlled (i.e., -0.16 to -0.08 and 0.05 to 0.02 for household structure and maternal education, respectively), which indicates migration for marriage is more sensitive to household characteristics. Finally, the size of coefficients for residence characteristics in a single-process model also changes in a multi-process model. While most of the effects become smaller, the coefficient for median family incomes turns significantly positive in the multi-process model (i.e., b=.03, p=.47, b=.10, p<.001, in a single- and multi-process model, respectively). This indicates that controlling for a simultaneous relationship with marriage, higher median family incomes in counties of residence encourage people to migrate.

Modeling the Timing of Marriage

Table 4 shows estimates from single-process and multi-process models predicting the timing of marriage. In these models, it is possible that those experiencing serial marriages hold distinct characteristics. As shown in Table 5, about 9% of the variance in the likelihood of marriage is attributed to individuals, which indicates that there are unobserved factors making some individuals more prone to marry.

Previous studies suggest that migration may increase the likelihood of marriage by expanding marriage markets (Jampaklay 2006). The single process model supports the hypothesis that migration is an investment for marriage (b=.10, p=.060), however, if the unobserved disturbance is controlled in a multi-process model, migration does not influence the probability of marriage (b=.04, p=.146). That is, the significant effects of migration on marriage

in previous research (Goldscheider and Waite 1987; Guzzo 2006) may have overestimated the relationships by disregarding the dependence between migration and marriage. Moreover, the total number of migration events increases the likelihood of marriage, though the effects are relatively small ($b=.01$, $p<.05$). Our findings verify significant synthesized relationships between migration and marriage demonstrated in the findings from a German sample (Mulder and Wagner 1993).

Consistent with previous research, the effects of individual and household characteristics are significant predictors of marital timing. Females marry earlier than males and non-Hispanic Blacks and Hispanics are less likely to marry compared to their non-Hispanic white counterparts. Even accounting for the unobserved factors affecting the decision to marry and migrate, the gender and racial effects persist. The effects of personal socioeconomic characteristics suggest that marriage is a life event that occurs after achieving economic stability to support the marital relationship (Cherlin 2010). Those with a high school diploma and a college degree are more likely than those with less than high school education to marry and employed persons, either part-time or full-time, are more likely than the unemployed to marry. Those living in metro areas are significantly less likely to marry and the effect remains significant after controlling for possible influences of unobserved factors. The effects of household and residence characteristics reduce once simultaneous relationships between migration and marriage are controlled. The results show that individuals from families with great resources in terms of greater maternal education and living in an intact family marry later than their counterparts with few resources. A unit increase in female population in the county of residence decreases the likelihood of marriage by 2% in a multi-process model ($b=-.02$, $p<.000$). Other county characteristics related to

marriage are economic conditions in residence, whose effects are relatively small in the current study.

Discussion

The current study allows for endogeneity between migration and marriage in the United States by estimating a joint model in which the risk that a moving event takes place affects directly the likelihood of marriage. The findings suggest that the model capturing event dependence (i.e., a multi process model) produces coefficients different from those of the model that does not (i.e., a single process model), which indicates significant interrelationships between migration and marriage. The dependent relationship was demonstrated in previous research (Mulder and Wagner 1993), yet the study uses data collected from West Germany few decades ago (i.e., 1981 to 1983) which limits to draw implications for the United States. Our results therefore provide evidence justifying the endogenous relationships between migration and marriage in the United States but also precise estimation skills for studying life course events. When modeling relationships between life course events, omitting interdependency could bias results of analyses but a joint model yields better estimates controlling for unobserved factors.

Our findings suggest that migration significantly increases the likelihood of marriage but it in fact stems from endogeneity of the two events. Individuals having greater likelihood of marriage – those with characteristics that are not explained in the model such as engaging to partners before moving or personal preference - may take the potential union formation into account when moving to new places. Estimating the likelihood of migration, marriage is positively related to migration in models both with and without endogeneity. People consider migration soon after getting married but also have unobserved characteristics that make them

mobile one year after marriage. It therefore indicates the role of migration as a life course transition such as a start or an end of other life experiences (e.g., marriage) described from theories on individual development (Arnett 2004), which is less likely addressed in previous literature on migration (Clark and Wither 2007) whose foci are mostly on economic factors (Massey et al. 1993). In addition, we extend exiting research on migration and marriage by using a multi-level model controlling for personal traits to repeat the events. The results reveal that the disturbance from each individual significantly influences personal choices to move and marry subsequently. Since individuals become more exposed to a series of transitions and life events in recent years (Kulu and Milewski 2007), the significant personal propensity we find needs to be included in studying life course transitions.

In the current study, person-year files are used to estimate the relationships between migration and marriage. Although person-years are considered manageable when using a large longitudinal dataset, the aggregated data may lose some important information (Allison 1984). As described, the relationships between migration and marriage in the same year or within a short interval such as 3 months or 6 months may have been underestimated in this study. Acknowledging the limitation, however, the measure of migration we use in analyses provides the most plausible information given the available data in the NLSY. Further research with information on exact dates of events will produce more precise estimates and contribute to better understanding of the complicated relationships between life courses events.

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Table 1. Description of migration and marriage histories

Variable	Proportions	Variable	Proportions	
Female	.48	**Household Characteristics**		
Race		R lived in an intact family until age 18	.64	
Black	.21	Maternal educational attainment (years)	11.60	(.09)
Hispanic	.07	**County characteristics**		
Education		Crime rate (%)	5.79	(.14)
Less than high school	.22	Female population (%)	51.41	(.08)
High school or equivalent	.59	Population with high school or more (%)	46.58	(.46)
College or more	.18	Population with college degree or more (%)	10.99	(.22)
Employment		Population unemployed (%)	5.85	(.13)
Employed part-time	.44	Median family income (dollars in 2008)	47505.7	(10475.2)
Employed full-time	.44	Persons below poverty level (%)	1.79	(.04)
Residence in metropolitan	.84			

Notes: 93,348 person-years for 7,945 respondents are included. All statistics were adjusted under survey setting in Stata. Numbers in parentheses are standard errors.

Table 2. Description of migration and marriage histories

Migration History	Proportion	Mean age	Duration	Marital History	Proportion	Mean age	Duration
Never moved	.31	-	-	Never married	.17	-	-
1	.17	25.82(.16)	4.41 (.08)	1	.60	25.27 (.14)	8.49 (.12)
2	.17	28.91 (.16)	4.17 (.09)	2	.19	33.47 (.20)	5.94 (.15)
3	.12	31.25 (.18)	4.16 (.09)	3 or more	.04	36.75 (.38)	4.93 (.33)
4	.09	33.51 (.19)	4.11 (.11)				
5	.06	35.36 (.22)	4.02 (.12)				
More than 5	.08	-	-				

Notes: 93,348 person-years for 7,945 respondents are included. All statistics were adjusted under survey setting in Stata. Numbers in parentheses are standard errors.

Table 3. Estimates from models for migration

Variable	Single process		Multi process	
	Coeff.	O.R.	Coeff.	O.R.
Marriage				
Married 1 year before migration	.45 (.16) **	1.57	.20 (.08) *	1.22
Total number of marriage	-.15 (.04) ***	.86	-.04 (.02) *	.96
Duration				
Duration to migration	-.14 (.02) ***	.87	-.11 (.01) ***	.89
Squared duration to migration	.01 (.00) **	1.01	.01 (.00) ***	1.01
Cubical duration to migration	-.00 (.00) ***	1.00	-.00 (.00) ***	1.00
Individual characteristics				
Female	-.05 (.03) †	.95	-.04 (.01) **	.96
Black	-.53 (.04) ***	.59	-.23 (.02) ***	.79
Hispanic	-.23 (.05) ***	.79	-.11 (.02) ***	.90
High school or equivalent	.43 (.04) ***	1.53	.20 (.02) ***	1.22
College or more	.22 (.04) ***	1.25	.13 (.02) ***	1.14
Employed part-time	.22 (.04) ***	1.25	.12 (.02) ***	1.13
Employed full-time	-.34 (.05) ***	.71	-.16 (.02) ***	.85
Living in metro areas	-.16 (.03) ***	.85	-.09 (.02) ***	.91
Household characteristics				
R lived in an intact family until age 18	-.16 (.03) ***	.85	-.08 (.01) ***	.93
Mom's education	.05 (.01) ***	1.05	.02 (.00) ***	1.02
County characteristics				
Sex ratio	-		-	
Crime rate	-.01 (.00) †	.99	-.00 (.00) ns	1.00
Population with high school diploma	-.03 (.00) ***	.97	-.01 (.00) ***	.99
Population with college degree or more	.02 (.01) ***	1.02	.01 (.00) ***	1.01
Population unemployed	-.01 (.01) ns	.99	-.00 (.00) ns	1.00
Median family income	.03 (.04) ns	1.03	.10 (.02) ***	1.11
Persons below poverty level	-.14 (.02) ***	.87	-.05 (.01) ***	.95
Intercept	-1.66 (.49) **	.19	-1.85 (.21) ***	.16
Log likelihood	-24515.07		-48966.15	
Wald Chi2 (21)	1940.10		4889.66	
Person-years		93,348		
Number of observations		7,945		

Notes: Numbers in parentheses are standard errors.
†p<.10, * p<.05, ** p<.01, *** p<.001

Table 4. Estimates from models for marriage

Variable	Single process		Multi process	
	Coeff.	O.R.	Coeff.	O.R.
Migration				
Moved 1 year before marriage	.10 (.05) †	1.10	.04 (.03) ns	1.04
Total number of migration	.03 (.01) *	1.03	.01 (.01) *	1.01
Duration				
Duration to marriage	.18 (.02) ***	1.20	.07 (.01) ***	1.07
Squared duration to marriage	-.01 (.00) ***	.99	-.01 (.00) ***	.99
Cubical duration to marriage	.00 (.00) **	1.00	.00 (.00) ***	1.00
Individual characteristics				
Female	.24 (.03) ***	1.28	.10 (.01) ***	1.11
Black	-.82 (.04) ***	.44	-.34 (.02) ***	.71
Hispanic	-.19 (.05) ***	.82	-.09 (.02) ***	.91
High school or equivalent	.33 (.04) ***	1.39	.16 (.02) ***	1.17
College or more	.27 (.04) ***	1.31	.12 (.02) ***	1.13
Employed part-time	.45 (.05) ***	1.56	.20 (.02) ***	1.23
Employed full-time	.79 (.05) ***	2.20	.38 (.02) ***	1.47
Living in metro areas	-.08 (.04) †	.92	-.04 (.02) *	.96
Household characteristics				
R lived in an intact family until age 18	-.05 (.03) †	.95	-.03 (.01) *	.97
Mom's education	-.02 (.01) ***	.98	-.01 (.00) ***	.99
County characteristics				
Sex ratio	-.04 (.01) ***	.96	-.02 (.00) ***	.98
Crime rate	-.00 (.01) ns	1.00	-.00 (.00) ns	1.00
Population with high school diploma	-.01 (.00) **	.99	-.00 (.00) **	1.00
Population with college degree or more	-.01 (.00) **	.99	-.00 (.00) **	.99
Population unemployed	-.02 (.01) **	.98	-.01 (.00) **	.99
Median family income	.02 (.03) ns	1.02	.02 (.02) ns	1.02
Persons below poverty level	.02 (.01) ***	1.02	.01 (.00) ***	1.01
Intercept	-.95 (.67) ns	.40	-.88 (.30) **	.42
Log likelihood	-24718.89		-48966.15	
Wald Chi2 (21)	1494.17		4889.66	
Person-years		93,832		
Number of observations		7,948		

Notes: Numbers in parentheses are standard errors.
†p<.10, * p<.05, ** p<.01, *** p<.001

Table 5. Estimated Random-effects

	Migration	Marriage
Migration	.12	
	(.10, .14)	
Marriage	.24	.09
	(.22, .26)	(.07, .12)

Notes: Numbers in parentheses are 95% CI.